FLYING

NOVEMBER
1946
25¢

AIRLINE TO THE MOON?
PAGE 27

How to Fly in Mountains
PAGE 43

Partial View of Aeroproducts Engineering Department Product Design Section

Where Tomorrow's Propellers are Designed Today

You are looking into the future here—at drawings of propellers for tomorrow's aircraft. Each design must incorporate basic characteristics proven by the Aeroprop's flight performance record. Simplicity for long life and dependability, unit construction for ease of installation and maintenance, lightness for payload advantages—these are a few of the principles which must be *designed into* each propeller before it can be called an Aeroprop. Manufacturer, operator and pilot know their worth.

Design and development work is performed to best advantage, of course, long before the prototype is test flown. Aeroproducts stands ready—today—to work with you in designing an Aeroprop precisely engineered to the needs of the aircraft you will produce tomorrow.

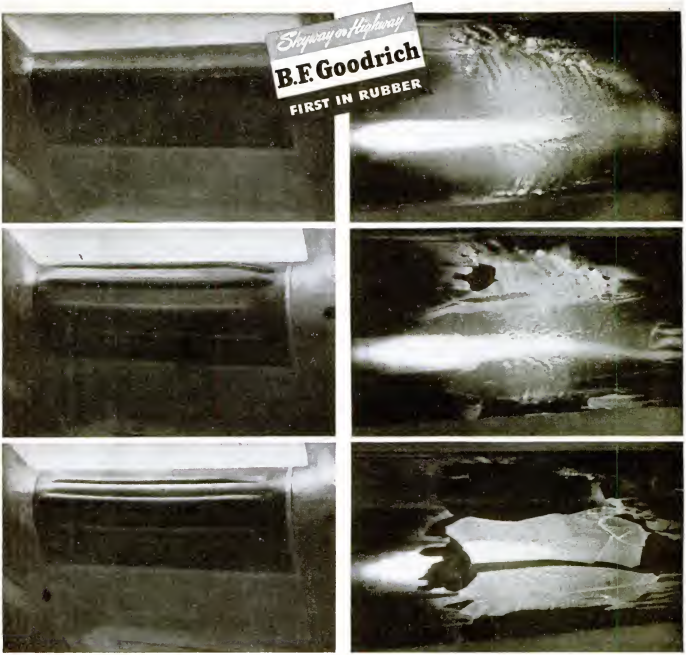
THIS IS THE AEROPROP—proud example of General Motors engineering skill. It is an instant-feathering propeller available with reverse pitch, electric de-icing, and all other features required for any installation. The regulator, hub, and blade assemblies are designed for unit installation or replacement. It is strong, light, and simple.

AEROPROP GM GENERAL MOTORS

Aeroprop

BUILDING PROPELLERS FOR AIRCRAFT TODAY
DESIGNING PROPELLERS TO MEET TOMORROW'S NEEDS

AEROPRODUCTS DIVISION • GENERAL MOTORS CORPORATION • DAYTON, OHIO



Here goes the De-Icer... there goes the ice

YOU'RE watching a B. F. Goodrich De-Icer at work. The pictures on the left show what happens under the ice that's being removed from a wing. Pictures on the right show what happens to the ice.

Chances are you've demonstrated the De-Icer principle when you took ice cubes from a rubber refrigerator ice-tray. When the ice-tray was flexed, the ice cubes cracked loose from the rubber and were easily removed. De-Icers are long rubber and fabric strips with tubes inside. Tubes are inflated and deflated, flexing the rubber, cracking the ice. The windstream carries it away, as it is about to do in the bottom right-hand picture.

The B. F. Goodrich De-Icer has many advantages that make it the best ice-elimination device ever developed for aircraft. De-Icers protect *all critical areas.* They afford full spanwise and chordwise coverage of wing and tail leading edges . . . where most ice forms. Weight is minimized. De-Icers represent only a fractional percentage of a commercial plane's gross weight, and this is negligible, considering the protection afforded plane and passengers.

De-Icers are still the object of study and research by B. F. Goodrich laboratory and field technicians to keep designs and types abreast of flight and plane developments. *The B. F. Goodrich Company, Aeronautical Division, Akron, Ohio.*

B.F.Goodrich

FIRST IN RUBBER

FLYING

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NOVEMBER · 1946

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THE COVER

Bruno Chiarello and Madeline Van De Wal recently flew this Luscombe seaplane from the Dawn Patrol Seaplane Base, Secaucus, N. J., to Highland Park, N. Y. on a cross-country vacation trip. Chiarello was a B-24 pilot in Africa and Italy, was shot down over Vienna and spent 10 months as a German prisoner. Kodachrome by Ben Ross.

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IT'S TRUE! YOU'RE REALLY GONNA GET AN

ERCOUPE!

And you're more thrilled than a kid with his first pay check! Well, being air-minded, too, we share your excitement.

But before you take off, we think there're two things you ought to know. One . . . the best investment you can make for your Ercoupe is the best in fuels and lubricants. Two . . . we think you'll find that, where fuels and lubricants are concerned, the best in the Mid-West come under the heading PHILLIPS AVIATION PRODUCTS!

So when you land lightly at some big-city airport or small prairie flying field, look for our famous Orange and Black "66" Shield. That's where you can get high quality Phillips 66 aviation engine oil, PLUS plenty of UNLEADED 80-octane gasoline for better performance and a cleaner motor.

Hope to get better acquainted with you. Let's make our meeting place the "66" pump! The Aviation Department, Phillips Petroleum Company, Bartlesville, Okla.

Phillips 66

AVIATION GASOLINE

This One
1L6E-5JF-SF62

HANGAR FLYING

LOCKHEED

The Unhatchable Egg

Research engineers out at Lockheed have been crowing about their new egg that flies but won't hatch. It's a *Constellation* engine assembly called the Universal Power Egg, and the way it simplifies maintenance is something.

For instance: gone are the antics that crews used to go through trying to expose an engine on a transport. Hinged, detachable cowl panels on the Egg flip back like the hood on a car, and there's your engine.

What's more, the oil tank in the Egg is forward of the fire wall. This may not sound exactly sensational, but one of the big time-eaters during engine changes has always been the inaccessibility of the tanks for cleaning.

The Power Egg is so universal that, theoretically, you could install Wrights on one side of the *Constellation* and P&W's on the other. No airline has tried this.

The previous Egg was all right; but Lockheed characteristically developed a better one. And it's this kind of self-starting ingenuity that makes good pilot-room talk and better ships.

L to L for L

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LETTERS

THEY FLEW TO MEXICO

After reading the article "Before You Fly to Mexico" (July issue), we decided to make the trip in our *Ercoupe*.

We had little time or trouble at Brownsville, in getting our papers, etc. We planned to heed Mr. Sherrill's advice and get to Tampico before 12 o'clock. But we were delayed and reached there at 12:58, therefore paid the *servicio-extraordinaria*—even the taxi fare to bring officials to the airport.

Credit should be given the *Cia Mexicana de Aviacion* [Pan American affiliate in Mexico] who were very helpful and courteous. In Mexico City we were met by Mr. Nava who had our ship serviced and tied down. Hotels were crowded but he got us a room. He advised us to get our money exchanged, called a taxi, wished us a pleasant stay. He also saw us off.

Airports in the states where we made overnight stops were most considerate. They got us rooms and transportation to the hotels. Some of these places didn't charge for an overnight tie down.

We were gone 12 days—a most interesting flight.

MILI AND BOB PHILIPS
Harrisburg, Pa.

OUR ERROR

I was interested in your September issue because several pages were devoted to a lightplane radio review. . . . I noticed in the heading that you listed equipment under $300. Since we are practically the only manufacturer building equipment for lightplanes with a published price of under $300, this appeared rather discriminatory, in view of the fact that our receiver and transmitter could have been listed separately (as was done for several other manufacturers), with separate prices under $300; i.e., $229 for the receiving system and $114 for the VHF transmitter. . . .

K. F. KELLERMAN
Aircraft Radio Corporation
Boonton, N. J.

● Aircraft Radio Corporation, one of the oldest aviation radio manufacturers in the U. S. was inadvertently omitted from "Lightplane Radio Review" in FLYING's September issue. Total cost of ARC's type 11 (see accompanying photograph) is $368, and it was here that FLYING's radio editor erred in automatically eliminating ARC. Listed separately, the units would have come within FLYING's $300 limitation. The receiver, complete with headsets, cabling, power supply, remote control unit and antenna system costs $241. It receives the 190-550 kc. band only. The transmitter is VHF and receives electrical power from the receiver's power supply. It is designed for five different channels but only two crystals are supplied. The microphone is included in total transmitter price of $127. Total weight of all units is under 15 pounds.—ED.

ANOTHER COLLEGE FLIGHT CLUB

I found your article "College Flight Club" (July issue) intensely interesting because we here at the University of California at Los Angeles—over 25 of us—have started the same type club—the Bruin Flying Club. We fly Taylorcrafts, a Luscombe, a Ryan and a *Mustang* from near-by Culver Airport. All of the instructors and members are students at U.C.L.A.

Organization is a long, slow process, although we are now a recognized club in the University's recreation association. But, we'd like to create interest in flying on the seven other campuses of the university and get flight courses installed for credit.

I intend to go to Denver to discuss common problems of organization and operation with the Pioneer Wing group in an effort to promote collegiate flying, and perhaps lay plans for future meetings of representatives from other college flight clubs. We believe that aviation training has a rightful place in college curricula.

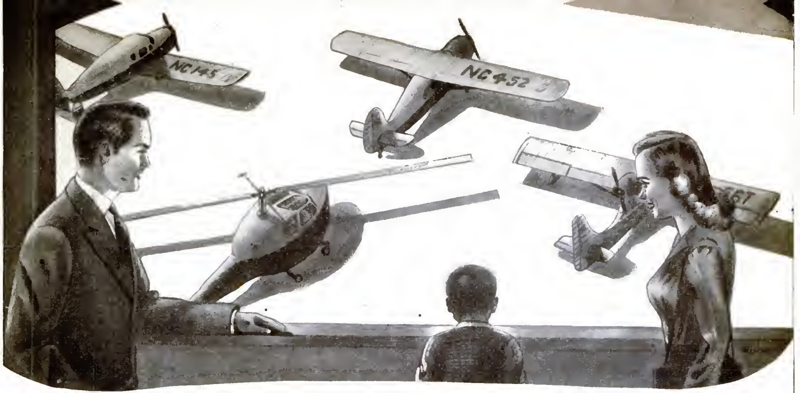
JOYCE STODDARD, Chairman
Bruin Flying Club
Los Angeles, Calif.

TIPS ON CABINS

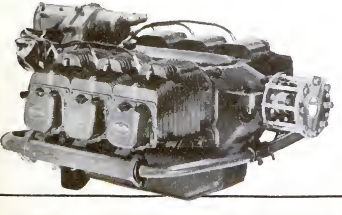
After flying small planes since 1932, I have often wondered where the small-plane designer gets his cabin specifications. Most planes seem to taper off

(Continued on page 100)

Aircraft Radio Corporation's low frequency receiver and VHF transmitter.



You get a better plane when you get
POWER BY FRANKLIN



Now	Stinson Voyager 150	*Franklin "335"*
"POWERED	Bellanca Crusair	*Franklin "335"*
BY	Republic Seabee	*Franklin "500"*
FRANKLIN"	Bell Helicopter	*Franklin "335"* *—Vertical*

Do you want 2-control or 3-control? Tricycle or conventional landing gear? Two place or 4 place? High or low wing? Land plane or amphibian?

These are only a few of the questions you have to decide when choosing your new personal plane. And don't overlook one of the most important of all:

"*What engine* for my plane?"

Franklin engines are backed by more air-cooled engine experience—46 years of it—than any other make. Franklin gives you an unsurpassed record of dependability, with economy of operation and maintenance. Franklin engines have long been recognized as quietest and smoothest in their horsepower range. Franklin offers such outstanding features as all-aluminum cylinders, steel timing gears, special heavy-duty crankshafts, and big-engine type carburetors with built-in altitude control, accelerator pump and idle cut-off. *Every* Franklin engine features electric starter and generator—and Franklin was the first light plane engine to offer them as standard equipment.

All these things add up to the fact that Franklin is a better engine—and a better engine means a better plane.

Choose a plane that boasts "Power by Franklin!"

Franklin
FINE AIRCRAFT ENGINES

AIRCOOLED MOTORS, INC. **SYRACUSE, N.Y., U. S. A.**

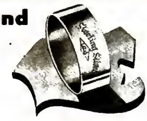
take

Imported Mediterranean briar ...

and

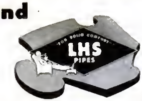
... hard rubber bits

and



... Sterling Silver bands

and



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HAVE YOU HEARD?

... About the paper shortage? That explains the varied grades of paper Flying has used recently. We expect that better paper in the near future will permit us to return to the uniform high-quality stock which has always been one of the hallmarks of Flying's excellent publishing job.

... A mobile flying school has been formed by 20 airline pilots in Tennessee. The outfit, which calls itself the Dixie Air Associates and claims a capital of $100,000, plans to cover all of Tennessee, giving flight instruction in communities which lack adequate flight instruction facilities. Present plans call for use of five planes and a large van equipped to meet all ground school requirements.

... Extra fare for DC-6 flights will be charged when those planes go into service. American and United Air Lines will follow TWA's example with the *Constellation.* This seems to indicate that there will be two regular tariffs on domestic airlines—one for standard service and the other for fast, delùxe service.

... The Navy will have a $2,000,000 hangar to house facilities for "delicate and intricate tests on radar and other electronic devices." It's being built now at the Naval Air Test Center, Patuxent, Md. With an overall length of 178 feet and a clearance of 67 feet, the hangar will provide facilities for testing equipment of every type of plane. Hangar interiors will be shielded by a ⅛-inch galvanized mesh wire to screen out electronic disturbances. The project will be completed next year.

... "Airscursion" is aviation's counterpart of the round-trip excursions featured by railroads and steamship lines. Atlantic Central Airlines inaugurated the idea with daily airscursions on its Atlantic City-Camden route. Vacationists now may depart from Camden just after breakfast, spend a full day at Atlantic City, Ocean City or other resorts and return home in time for dinner.

... Experimental air conditioning for use on Republic's Rainbow has a pressurization range of 32,000 feet. The system is being designed by AiResearch Manufacturing Co. Using this system, at 40,000 feet the *Rainbow* would have a cabin atmosphere of only 8,000 feet, a range far in excess of anything heretofore achieved for a large cabin.

... Steel-reinforced concrete cells for testing jet and gas-turbine engines and allied equipment has been installed by Ryan Aeronautical Co. at Lindbergh Field, San Diego. It has instruments to measure jet engine thrust and fuel consumption so that engineers will be able to run complete ground tests of jet power plants. Similar to the Army's test equipment at Muroc Lake, it has been given more flexibility to accommodate a greater variety of units.

... A helicopter went to the horse races as a "flying steward's stand" at Rockingham Park, N. H. This novel method of spotting fouls was considered a huge success. The 'copter hovered about 75 feet over the horses, giving the steward a much better picture of the race than was possible from the box at the finish line or from the elevated towers around the track.

... The Navy wants five of the Army's B-29s to use in testing Navy-developed jet engines and to run experiments on guided missiles and pilotless aircraft at high altitudes. The Army already has loaned three *Superfortresses;* they are operated by Army crews in a joint Army-Navy project sponsored by the Office of Research and Invention.

... The National Advisory Committee for Aeronautics wants engineers and physicists. Salaries for the positions offered range from $2,644.80 to $5,902.20 per year, depending upon the applicant's qualifications. Specifically, the NACA needs aeronautical, structural, electrical and mechanical engineers, physicists and naval architects. Applicants should write to the NACA employment office at Langley Field, Virginia.

... A 75,000-word German-English dictionary of German aeronautical words, phrases, idioms and slang is being compiled by the Air Materiel Command. Material is being extracted from broken enemy codes and from 250 tons of captured air documents.

... A Sikorsky S-51 helicopter won a race with a *Lodestar*, an automobile and a train over a 50-mile course from Bridgeport to East Hartford, Conn. The helicopter did it in 31 minutes, the *Lodestar* in 21 minutes, but added another 27 minutes in getting passengers aboard, starting, and getting passengers off the plane. The auto took 1 hr. 35 min. and the train 2 hr. 2 min.

... An experimental helicopter will be built by Lieut. C. R. Haig, Jr. The new model will have a three-place open cockpit, tricycle landing gear and single main motor. It will have a cruising speed of 65 m.p.h., range of 160 miles and will carry a 540-pound payload. Haig plans to start production about February, 1947, at the Oakland Municipal Airport. END

Photography by Morton B. Kelman

Gentlemen:

I'd like to fly the Culver Model "V." Who is my nearest Culver Dealer?
(I am, am not a pilot.)

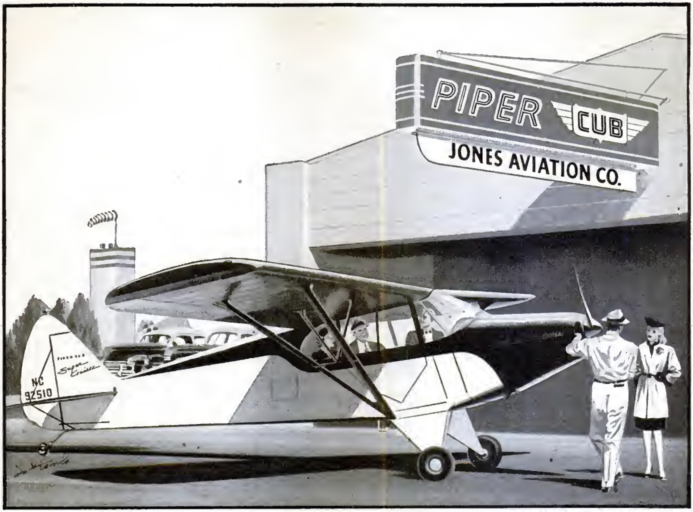
NAME______________________________

ADDRESS______________________________

CITY________________STATE______________

CULVER AIRCRAFT CORP., DEPT. F, WICHITA 1, KANSAS

FIRST IN THE BLUE
WITH SOMETHING
New!
CULVER



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PIPER

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—for Reconnaissance and Rescue

Drawing on the wartime Seahawk's extensive service with the Pacific fleet, Navy and Curtiss-Wright engineers have developed the SC-2, a new scout plane of unprecedented range, speed, fire-power, and general utility.

More room in the fuselage, with an extra seat aft of the pilot, provides for air-sea rescue work or for reconnaissance photography. Firepower has been increased beyond that of previous types by the installation of rockets under the wing. The new, hydraulically operated cabin enclosure is equipped for quick opening by compressed air in emergencies. A Wright Cyclone engine with two-speed supercharger gives the SC-2 a service ceiling of 28,000 feet, and provides increased range and speed. It is equipped with a Curtiss Electric hollow steel blade propeller.

The Seahawk is now being delivered to the Navy from the Curtiss-Wright, Columbus, Ohio, plant.

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Airplane Division
COLUMBUS, OHIO

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BACK TYPES

The harness and pack are integral; the thin pack fits close to the back; the smooth pack has no projections or bulging mechanisms on the surface.

C.A.A. REGULATIONS

All parachutes used in civil aircraft must be inspected and repacked by a licensed inspector or rigger. (Contact nearest CAA office concerning a licensed rigger or inspector)

Personal Type PARACHUTES

COMPLETE INCLUDING HARNESS

SEAT TYPES

Harness and pack are integral on the Fixed Type Seat Model. It is a general purpose outfit, excellent for bucket seats or where headroom is not at a premium.

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This is a combined two-Approved type consisting of a fixed back pack with a harness to which a quick attachable chest type may be attached.

CHEST TYPE

*Intended to be carried in any accessible position where it can be reached quickly in an emergency. Attachment of the pack to the harness is accomplished thru one downward motion of the pack.

PARACHUTES

TYPE	ARMY STOCK NO.	PRICE	
		Unused	Used
Troop training type	8300-647300	$144.00	$115.00
Back type B-8 (24')	8300-637805	63.00	50.00
Back type B-9 (24')	8300-635835	64.00	51.00
Seat 'C' type 24' canopy	8300-637810	61.00	49.00
Seat 'C' type 28' canopy	8300-637825	68.00	54.00
Quick adjustable chest type	8300-635750	70.00	56.00

HOW TO BUY:

These parachutes are available for immediate delivery by Authorized Agents from the stocks on hand or from War Assets Administration direct. (see list)

VETERAN PREFERENCE

You may use your priority in buying from War Assets Administration Agents. CAA REGULATIONS Part 42-409, Part 42-410. Apply to use of parachutes.

WAR ASSETS ADMINISTRATION

National Aircraft Component Sales Center
6200 Riverside Drive (Municipal Airport) Cleveland 32, Ohio

or any of the below named agents

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424 North Queen Street
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Columbus 15, Ohio

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6265 San Fernando Road
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*Irving Air Chute Company, Inc.
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*Parachute manufacturers

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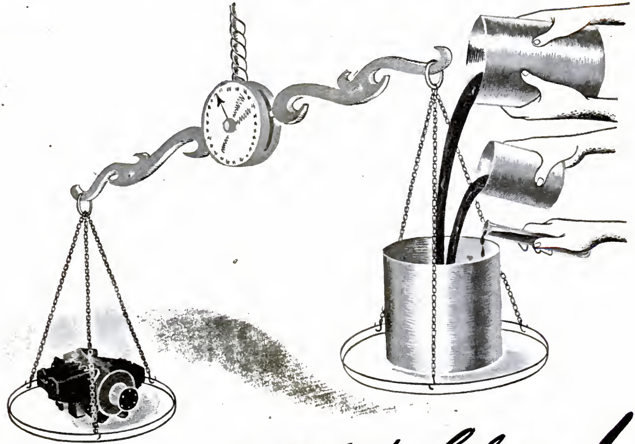

... a calculated balance!

OURS would be a simple job if your plane engine needed just one kind of lubrication. . . .

The point is, the *same* engine oil must lubricate and cool surfaces under a wide range of bearing pressure and temperature conditions . . . must do its job without penalizing any vital part.

That's why a quality oil like Aero-Shell is a "calculated balance" between engine requirements and oil characteristics—why Shell employs solvent-extraction refining and scientific blending to produce an oil that gives superior service in the performance of its many-sided task.

Let the Shell sign be your guide to top-quality lubricants and fuels . . . to careful, efficient service . . . to greater enjoyment of travel by air.

SHELL

FINER FUELS FOR THE AGE OF FLIGHT

SHELL AVIATION FUELS • AEROSHELL LUBRICATING OILS AND GREASES • SHELL HYDRAULIC FLUIDS

Envy of the Airport...

HE FLIES *AERONCA!*

It's A Honey—This New Aeronca Champion! . . . Offering More Luxury—More Flying Ease—*More For Your Money* Than Any Other Low Cost Plane!

Here's Your Best Buy in the Low Price Field—THE NEW AERONCA CHAMPION!

WHAT a feeling of pride *there is* in the ownership of this sleek, new Aeronca Champion! What a feeling *you get* when you take her skyward! Here *is* the plane with everything you want!

Of all low-priced planes, only the Aeronca Champion gives you 300° visibility . . . unhampered vision on take-offs, landings and in the air. Thanks to Oleo landing gear and low 40 mph. landing speed you can land smoothly "almost anywhere". Aeronca's landing run is only 350 feet.

You get new ease of handling in the air. New luxury within. Wide automobile-type door and handy step for easy access. Big upholstered, lounge-type seats for comfortable, relaxed flying!

Get out to the airport soon! See Aeronca—fly it—compare it, feature for feature, with any other. And remember—when you *buy* Aeronca, your dealer will teach you to *fly* Aeronca *FREE!* Aeronca Aircraft Corporation, Middletown, Ohio.

OVER 1000 AERONCA QUALIFIED DEALERS TO SERVE YOU at handy airports all over the U. S. A.

So Safe — So Simple — Now Anybody Can Fly

AERONCA

America's No. 1 Low Cost Plane

PROGRESSIVE

The performance, dependability and ruggedness of Beechcraft products prove the progressive ability of Beechcraft to build airplanes that are outstanding in their class.

For those who wish an unbiased personal evaluation of the merit of Beechcraft products we refer them to any experienced military pilot who served in the Armed Services or to any veteran air-line captain.

The Beechcraft distributors listed below likewise uphold the finest Beechcraft traditions....You are invited to contact them for Beechcraft products.

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Challenger Airlines, Inc., Salt Lake City, Utah
Dallas Aircraft Sales, Inc., Dallas, Texas
Francis School of Aviation, Detroit, Mich.
Harrington Air Service, Mansfield, Ohio
Aircraft Division of R. L. Harrison Co., Albuquerque, N. M.
Hawthorne Flying Service, Orangeburg, S. C.
Interstate Airmotive, Inc., St. Louis, Mo.
Harold S. Johnson, Louisville, Ky.
North Side Motors, Minneapolis, Minn.
Ohio Aviation Company, Dayton, Ohio
Pacific Aircraft Sales Co., Oakland, Calif., Burbank, Calif.
Page Airways, Incorporated, Rochester, N. Y.
W. U. Paul, Corpus Christi, Texas
Philadelphia Aviation Corporation, Philadelphia, Pa.
Pittsburgh Aeronautical Co., Homestead, Pa.
Plains Airways, Cheyenne, Wyo.
J. D. Reed Company, Houston, Texas
Southern Air Services, Memphis, Tenn.
Southern Airways Sales Co., Inc., Atlanta, Ga.
Southwest Aviation Service Corp., Oklahoma City, Okla.
Topeka Aircraft Sales & Service, Topeka, Kan.
Tulsair Distributors, Tulsa, Okla.
Roscoe Turner Aeronautical Corp., Indianapolis, Ind.

Model 18 The Beechcraft seven-to-nine place executive transport is a familiar airplane on airports in all parts of the world. Its sturdy, dependable performance and the flexibility of seating and cargo arrangements make it ideally adaptable for executive personnel or as an air carrier. Design and performance permit operation from small landing fields.

Model 17 The Beechcraft Model 17 biplane provides the discriminating personal or sportsman pilot an airplane of beauty and speed. Pilot and four passengers are able to ride in roomy comfort at 200 miles an hour. Negative wing stagger, an exclusive Beechcraft feature, affords clear visibility and ready cabin entrance.

Model 35 The new Beechcraft Bonanza cruises at 175 mph., consumes 10 gallons per hour, carries four 170-pound people and 100 pounds of baggage, lands at 46 mph. Its range is 750 miles at 165 mph. It has a direct operating cost of as low as 1 cent per passenger mile. It's delivered complete for day, night and instrument flight.

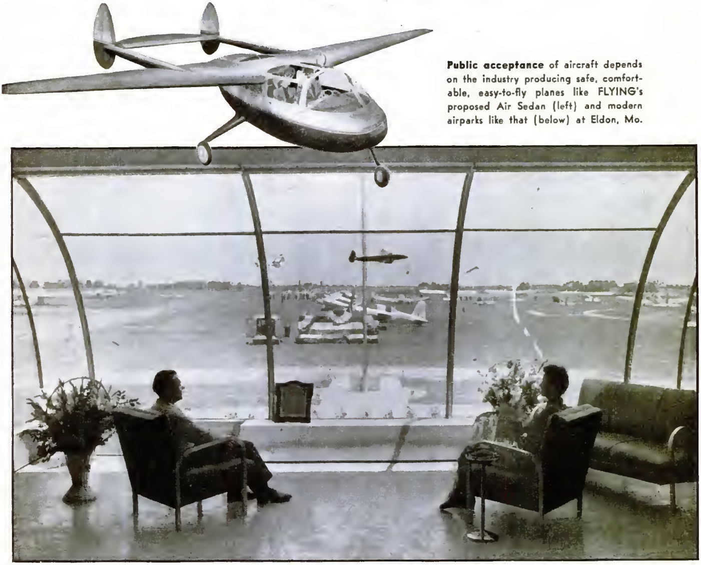
Beech Aircraft

CORPORATION
WICHITA, KANSAS, U.S.A.

THE WORLD IS SMALL
WHEN YOU FLY A BEECHCRAFT

FLYING
NOVEMBER
1946

Stop Selling Aviation to Ourselves!



Public acceptance of aircraft depends on the industry producing safe, comfortable, easy-to-fly planes like FLYING's proposed Air Sedan (left) and modern airparks like that (below) at Eldon, Mo.

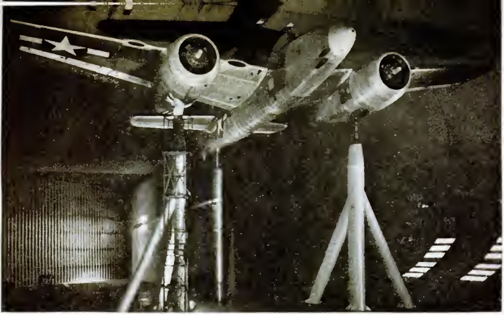
By T. P. WRIGHT
Civil Aeronautics Administrator

IT'S NON-FLYERS WHO NEED CONVINCING, SAYS CAA CHIEF.

THE aviation industry today stands at the threshold of its greatest opportunity—the production of an airplane for personal use which will be a vehicle of utility.

The Civil Aeronautics Administration has dedicated itself to aiding the industry in making such a personal plane not merely a possibility but an actuality. The four fundamentals which must be built into this personal plane are (1) reduction of noise, (2) more performance at less initial cost, (3) comparable reductions in maintenance and operation costs, and (4) more safety features.

To implement this program, the CAA has recommended to the National Advisory Committee for Aeronautics seven specific research projects among which are the following on which the NACA is now working: (1) reduction of noise, both propellers and engines; (2) gas turbine propeller combination power plants; (3) fuel with less fire hazard; (4) power plant consisting of jet-driven propeller blades; (5) windshield with smooth water clearance,



Research in lightplanes is needed on the same scale as is done on the more complex combat aircraft—such as Grumman Tigercat (left) being wind tunnel-tested at NACA's Ames Aeronautical Laboratory on west coast.

investigated at the Cleveland ice tunnel (this is to take the place of windshield wipers); (6) reports summarizing NACA work on control and stability at low speeds; (7) report summarizing NACA work on tail surfaces.

At the same time, the CAA is undertaking within the province of its own mandate from Congress a reduction in the number of regulations, complete elimination of those regulations which are onerous and do not contribute to safety, and is exploring other avenues of a regulatory nature which can be eliminated.

Our immediate and fundamental needs are the four primary objectives outlined above, because the airplane must be a good neighbor. Unless the airplane is made a vehicle of utility, there will be no steady increase in the number sold after it has reached the plateau which the present enthusiasm and sales make possible. We are today—and I must say, fortunately—in the midst of a tremendous upsurge of flying and of the purchase of personal aircraft. This is made possible by two factors—the release from the armed services of hundreds of skilled pilots and the fact that there are available millions of dollars in wartime savings. However—and I regret to say this—the record of resale of personal planes in the past 10 years reveals that the original owner, faced with the fact that the maintenance of an airplane is expensive and does not provide cheap mass transportation for his family, has been forced to sell his plane.

Utility is demanded by the newcomer to aviation. His plane must be able to land anywhere, be safe, economical to own.

Equally significant is the fact that the general public has not been educated concerning the present and future community values in aviation. As time goes by, it becomes increasingly apparent that there is less call for selling the airplane on its home ground, the airport, and increasingly urgent need for selling it by education in the marketplace and up and down the neighborhood streets of the nation.

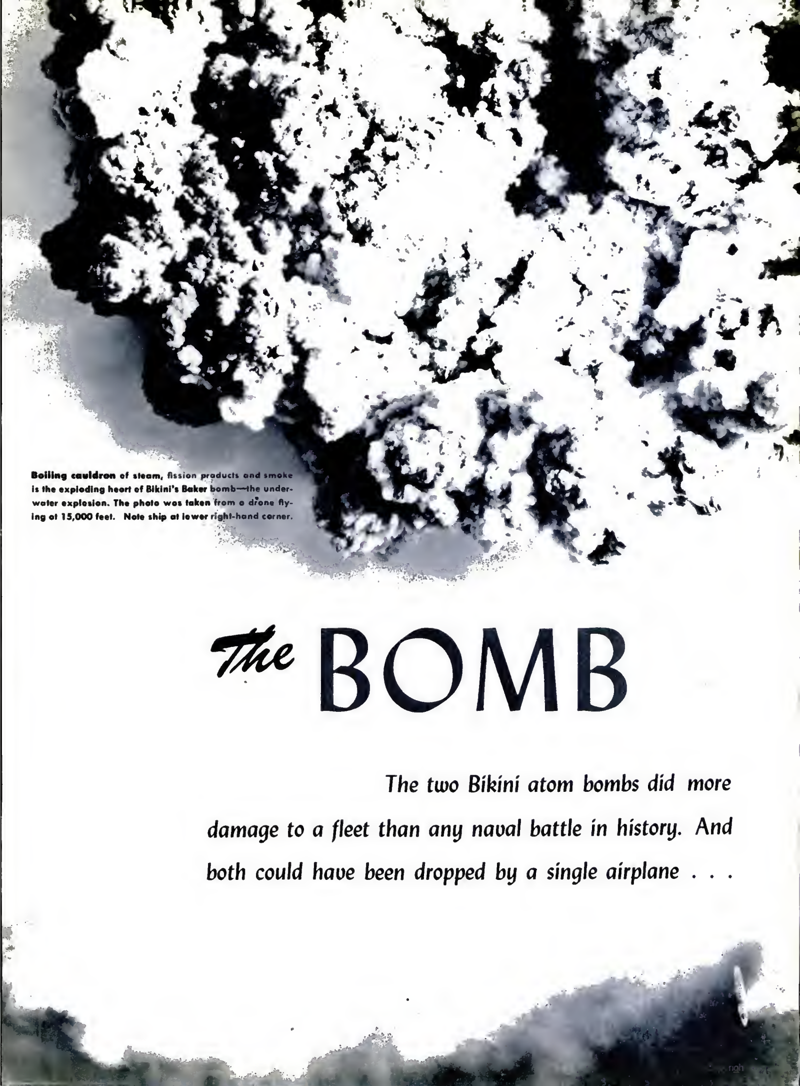
This requires Federal-industry teamwork of the highest order—and requires it urgently. The CAA airport program is a classic example of what I mean. When $500,000,000 was appropriated to build airports, lightplane manufacturers and the CAA were jubilant. We knew and said that more airports would be a great boon to lightplane flying. By the summer of 1947, we told ourselves, the program would be going full throttle and the demand for planes would increase accordingly.

But repeatedly, cases came up showing that the public, living in a quiet neighborhood, looked upon an airport as a social and economic menace. We weren't prepared to prove this wrong, and we had done little or nothing toward mass education.

Nobody had told the average man that the lightplane, properly used, is hardly more noisy than an automobile, less than a noisy truck, and that in the future lightplanes, properly muffled, may be less noisy than any other modern vehicle.

Even his children—imbued with the daredevil glamor of war flying—had not been properly educated on the safety and social values of peacetime civilian flying. At scores of points across the nation aviation enthusiasts in a community qualified to get Government funds to help them build a field ran into a stone wall of opposition.

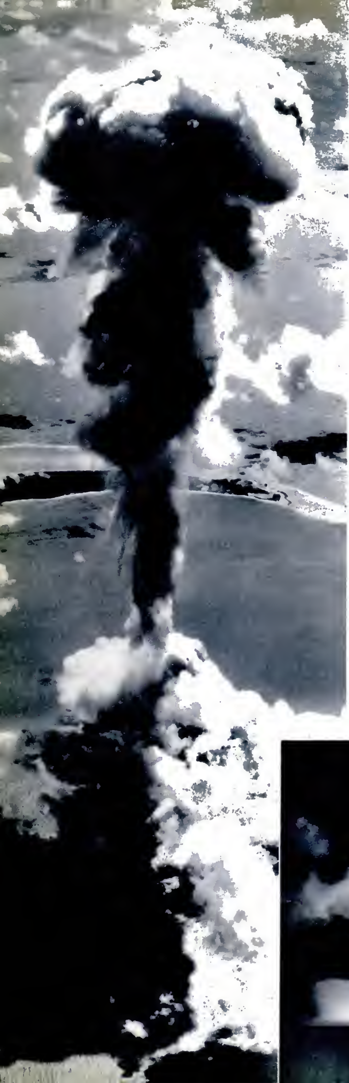
That's where the teamwork came in—for an excellent current example of how Government and industry can work together, in my opinion, has been the campaign of education on community airports. Neighbors tried to ban an airport in Pennsylvania recently, for example, and the case went to court. Repre- *(Continued on page 60)*



Boiling cauldron of steam, fission products and smoke is the exploding heart of Bikini's Baker bomb—the underwater explosion. The photo was taken from a drone flying at 15,000 feet. Note ship at lower right-hand corner.

The BOMB

The two Bikini atom bombs did more damage to a fleet than any naval battle in history. And both could have been dropped by a single airplane . . .



THIS is The Bomb. Team it with an airplane and it dwarfs all other weapons in history. The new B-36 can fly it to any target in the world. Although, like other explosives, it need not be delivered by airplane, the atomic bomb can be sent to its target faster, more accurately and more closely timed through the air than by any other means.

The first bomb at Bikini was delivered by air. The second could have been. Of the five atomic bombs exploded so far, three have been dropped from the air. Together the airplane and the atomic bomb represent a force so powerful that all previous military ideas, all armies, all navies are obsolete before them.

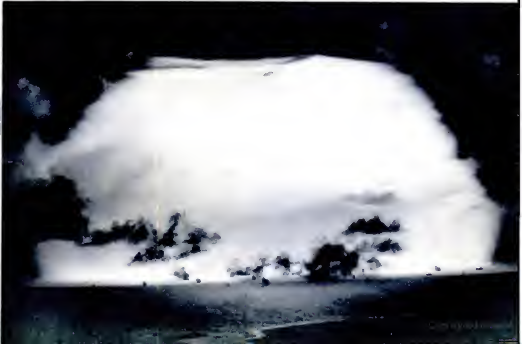
This was demonstrated irrefutably at Bikini. It is proved in the photographs presented here. The two medium-sized atomic bombs at Bikini did more damage than has ever been done in a modern naval battle. A score of ships were sunk. The remaining 55 to 60 were no longer seaworthy . . . they were not even habitable. Detonated in the incompressible water, even the shallow water of Bikini Lagoon, the atom bomb showed itself to be an explosive force of fearful destructiveness. But beyond that it is a poison weapon. It drenched the ships with lethal rays and with radioactive water which would have been fatal to crew members. Ships remained radioactive for a long time. Even the water in their vicinity could not be approached for hours. Death rays cut through the thick steel sides of the battleships like a sharp knife through soft cheese.

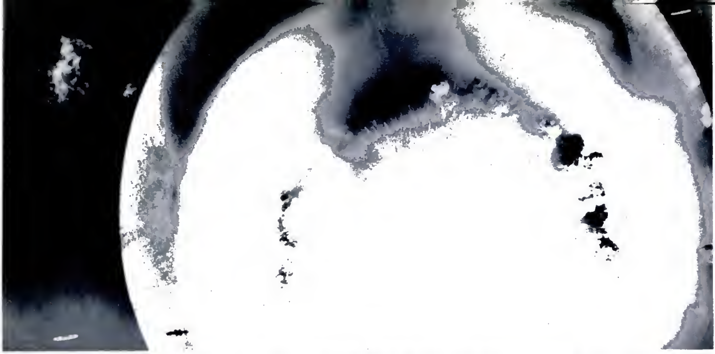
The photographs show that within a few seconds of the bomb's explosion, several near ships were already damaged. Its explosive impact, radiation and fire are triple-threat weapons which the atom bomb holds over every navy in the world. Even so, our own Navy is now talking about designing ships "to withstand the atom bomb."

To a nation given a terrific ad- *(Continued on page 98)*

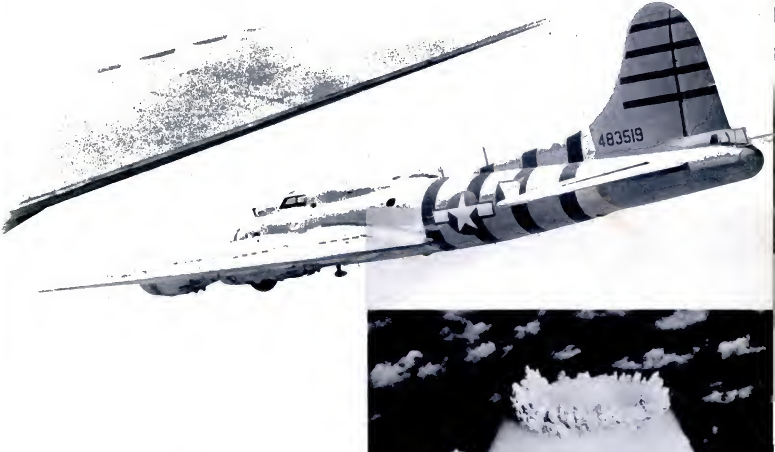
Pictures Continued on Next Pages

First Bikini bomb (left) was exploded in mid-air on July 1. It sank several ships, left others radioactive, but it did not—and was not expected to—do as much damage as the underwater bomb exploded July 25. The instant of that flash is shown below. Bomb glare was a thousand times brighter than the sun. Note that anchored ships had steam up.

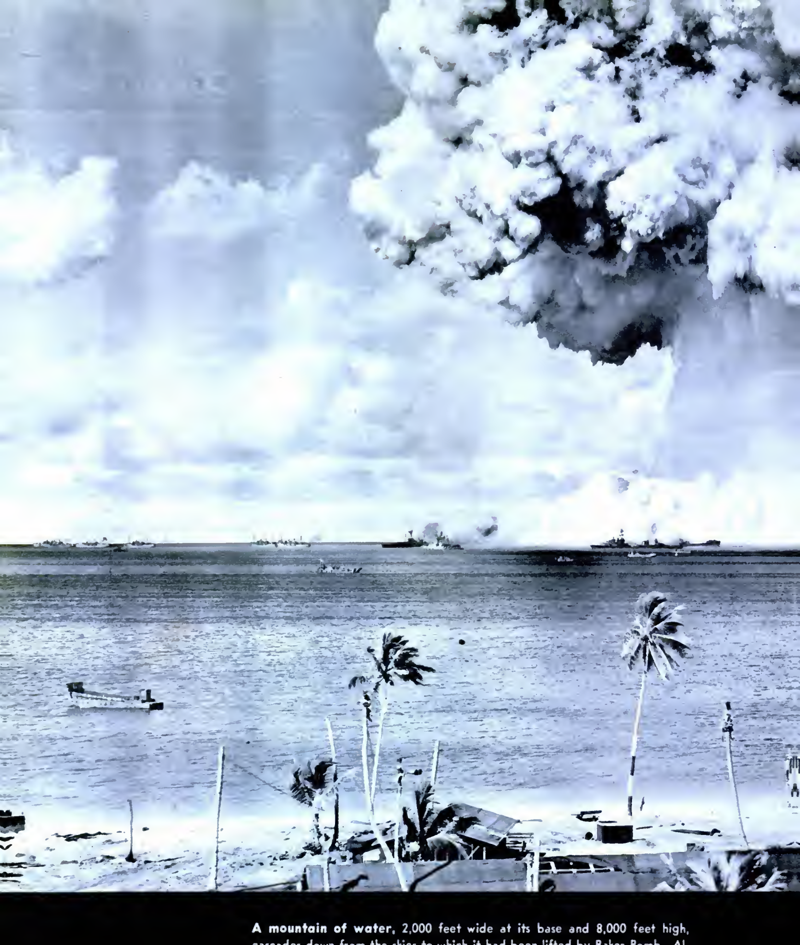




Looking into the vortex of hell itself, the center of the second Bikini explosion, which generated a heat of millions of degrees. Initial explosion appeared as a series of concentric circles. Picture was taken from drone more than 15,000 feet above target.



Flying Fortress drone flies under the protecting wing of its B-17 mother plane. Drones were used successfully during atomic bombings to take photographs, record radioactivity, broadcast television pictures, and bring back samples from the atomic cloud. Not one drone was lost in bombings. Ships on edge of mushrooming explosion (right) were damaged or sunk by the blast.



A mountain of water, 2,000 feet wide at its base and 8,000 feet high, cascades down from the skies to which it had been lifted by Baker Bomb. Although this underwater bomb was set off from an LST, it could as easily have been dropped from a single undetected bomber in an attack which could cause more damage than all the Jap planes at Pearl Harbor. Ten ships were sunk initially by this bomb and six more were seriously damaged. The three biggest ships sunk were the battleship Arkansas, which simply dis-

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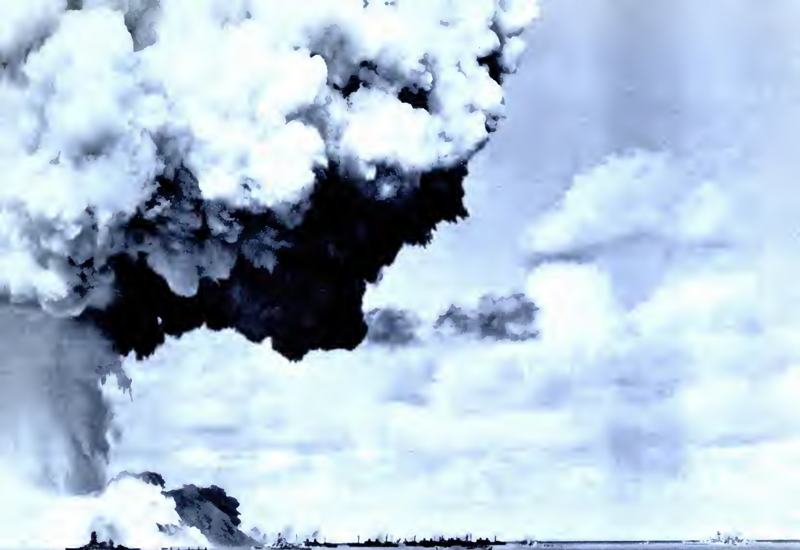


appeared; the 33,000-ton carrier Saratoga and the Japanese battleship Nagato, both of which sank later. Another view of the explosion, shown on the opening page of this article, was photographed by drone. Submarines were submerged for test. Visible are destroyers, attack transports, LST's, LCI's and LCM's, barges, a floating drydock (right center) and one airplane, a Consolidated Coronado flying boat (far right). Note smoke from ships, all of which had steam up in order to test the effect of the bomb on the boilers.

Lunching as Barre-Montpelier guests are Dorothy Erskine, Boston; Mrs. R. C. Blott, N. Y. City, and George Bevins, Hackensack, N. J.

Buses meet tourists at Newport, Vt., on second day of tour to take them to a Lake Memphramagog resort for dining, dancing and entertainment.

Yankee Air Holiday

Fun, fellowship and airplanes get together on this New England tour.

MORE than 200 New Englanders rounded up nearly 100 lightplanes late this summer for a 582-mile air tour that touched all of their home states. Chief objective of the tour sponsors, the New England Aviation Trades Association, was to see just how much fun and good fellowship could be packed into three days of flying, and to show the results to as many potential flying enthusiasts as possible.

Off to a slow start because of threatening weather, only 30 planes showed up for the initial take-off from Rhode Island State Airport at Hillsgrove. But with weather clearing, the tour picked up 50 more planes at Concord, N.H., where Mayor Charles Davie and New Hampshire's Governor Charles M. Dale, were luncheon hosts to the flyers.

Other entertainment highlights were a luncheon given by chambers of commerce at Barre-Montpelier, Vt., an old-fashioned clambake at Lewiston, Me.; and an evening of dining and dancing at a Lake Memphramagog resort near Newport, Vt.

Townspeople thronged the airport at each stop. They saw practically every lightplane, new and old, currently available—and they saw a fair representation of the constantly-increasing mass of private pilots.

There was Dr. Lothar Nietsch, 59-year-old flying physician of New Bedford, Mass., who has been a pilot for 11 years—and Mrs. Ethel Haywood, Worcester, Mass., who at 61 has been flying her own plane for more than

Relaxing on lake shore, men talk flying while women dress for evening of dancing.

Luncheon stopover, on last day of 582-mile trip that touched all six New England states, was made at Keene, N. H., airport. Final tally showed more than 200 flyers, 100 planes participating.

Tourist plane lineup, photographed during luncheon stopover at Barre-Montpelier, Vt., airport on second day of tour, shows only a third of the planes that had joined trek by that time. Lunch for flyers was provided by chambers of commerce of the twin cities.

Oldest pilots were Dr. Lothar Nietsch of New Bedford, Mass., and Mrs. Ethel S. Haywood of Worcester, Mass.

Despite bicycle crackup, Iris Farnsworth, of Fryeburg, Me., made tour, got autograph from Hank Kubic, Lock Haven, Pa.

Honeymooners Mr. and Mrs. Floyd Stone, Shrewsbury, Mass., were married the day before the Yankee Air Tour began.

Younger set included Mary Plaisted, Manchester, N. H., and her fiance, Bruce Sundlin, Harvard law student, Providence, R.I.

Schoolteacher Steve Storm, Cornwall, Conn., made tour in a Fairchild Cornell he acquired at war surplus sales.

seven years. There were youngsters like Leah Schloss and Bobbie Robertson, who flew their *Skyranger* up from Baltimore, Md.; Newlyweds Mr. and Mrs. Floyd Stone of Shrewsbury, Mass.; and Betrothed Mary Plaisted and Bruce Sundlin of Providence, R. I. There was even one pilot (Iris Farnsworth, of Fryeburg, Me.) who made the tour wearing a hip-to-ankle plaster cast after breaking her leg in a bicycle crackup two weeks before.

First post-war revival of the Yankee air tour (there were three such tours prior to 1940), the new version was pronounced an overwhelming success. Sponsors expect 250 planes next year and are worrying already about how they'll entertain all the new flying enthusiasts they have created. END

Airline to the Moon?

Rocket research gives promise of spanning interstellar space.

By F. R. STOUT

RECENTLY a scientist told a group of business men at a Chicago luncheon that it was entirely reasonable to expect that, within a few decades, man would achieve his ambition to fly to the moon. Further, he offered to bet that when the machine capable of making the trip was ready to fly, 100,000 volunteers would compete for seats.

The ensuing noise was so great that several flies caused a minor disturbance, clumping around on the tablecloths with their big, clumsy feet. There was not a sound of laughter until someone asked whether the ride would be a round trip.

Perhaps as late as a few months ago, the man would have been taken for a humorist, if not a visionary crackpot. The future in the sky has been etched very recently and very clearly by the Army and Navy, however, and with the memory of the German V-1 and V-2 still warm, skepticism is no longer stylish.

The Germans were years ahead of the United States—and of all other countries for that matter—in producing jet propulsion and rocket units for aircraft and pilotless missiles. Their 3,500-m.p.h. V-2 was simply the most successful of their large, rocket-powered, death-dealers, not the only one. Intelligence reports of the technical branch of the Air Materiel Command, which thoroughly investigated all aspects of German research when the war ended, make very sober reading. The Germans had literally scores of rocket missiles in the planning or project stage, of a wide variety of sizes, and for every foreseeable purpose.

It should not be forgotten, when questions of appropriations for American research are raised, that the Germans had the first operational jet propulsion fighter in the Messerschmitt Me-262. They also had the only operational man-carrying rocket-propelled aircraft in the war: the Messerschmitt Me-163. Nowadays, the newspapers

GAPA missile almost immediately accelerates to supersonic speed as it soars aloft in Army tests near Wendover, Utah. Purpose of the radio-controlled rocket is to seek out and destroy enemy aircraft or missiles.

carry reports of strange objects shooting through the air over Sweden. They do not say who does the shooting, but it is reasonable to assume the experimenters are not working for a non-existent German government—though they may be Germans.

Well, the United States was late, but we now are very busy with jet propulsion and especially with rockets, which appear to be the source of energy destined to take us through the sonic barrier into the breath-taking speeds of 1,500 to 4,500 m.p.h. the Army is aiming for. Most of the fearsome predictions of the course of the war of the future, however, describe horrible destruction to come from pilotless missiles.

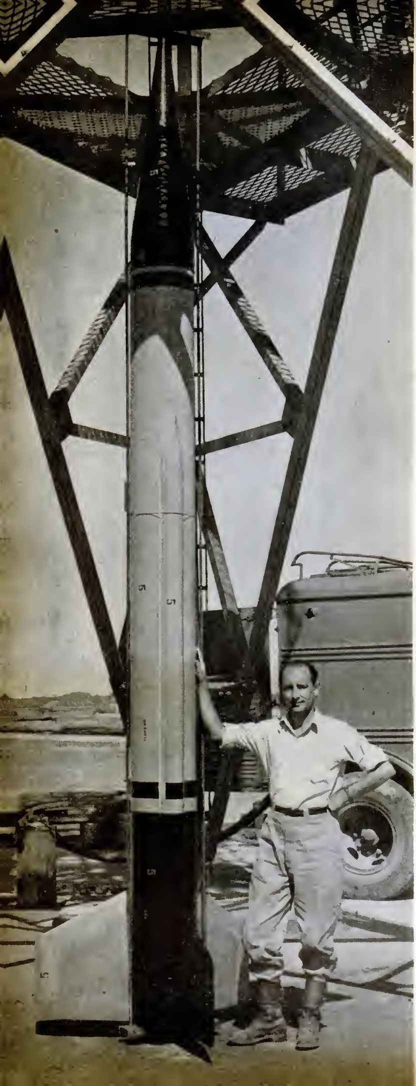
The Army and Navy have finally lifted censorship from some of the rocket research both have been engaged upon, with the most spectacular results coming from captured German V-2s, as might be expected. Already, in the southwestern desert, a V-2 has been shot 104 miles into the atmosphere, farther than any other man-made object has ever gone from the earth. All the data obtained in captured German documents, and presumably the knowledge of some captured German scientists, is being integrated with techniques carefully worked out in our own country.

The Army's principal research projects in rocket propulsion were carried out during the war under the code name GALCIT. The letters were taken from the capitals of the name of the parent institution: Guggenheim Aeronautical Laboratory of the California Institute of Technology. GALCIT's research resulted in the first take-off in the United States of an airplane assisted by jet propulsion, the technique that later became famous as JATO (jet assisted take-off). That first successful rocket-assist was accomplished with a rocket motor burning a solid fuel. Later, GALCIT achieved another first: a rocket assist to a bomber with a motor that used liquid fuel.

GALCIT's rocket investigations began in 1936 with a small, privately-organized program. Several reports were issued in the next two years, among them one suggesting rocket assisted take-offs. Gen. H. H. Arnold, AAF commanding general, requested the committee for Air Corps research of the National Academy of Research to sponsor investigation of rocket boosters in 1938. The problems were assigned to GALCIT. In July, 1940, the AAF assumed direct control. GALCIT expanded in scope and importance.

Bounded by a fenced enclosure near Pasadena, Calif., the laboratory's 80 buildings sprawl over about 40 acres. There are numerous heavily-protected pits for trials of solid and liquid fuel rockets, for ram-jet and turbo-jet engines. There is a towing channel for research in the behavior of rocket-driven underwater missiles. The staff numbers more than 385, and facilities and equipment are valued at about $3,000,000.

The laboratory's first important project was the development of a slow-burning solid rocket charge capable of longer duration thrust than one second. Most rockets of the time were quick burning, unsatisfactory. The first experimental motor was a steel pipe two feet long, with walls one inch thick and an inside diameter of three inches. One end was plugged, the other fitted with a pipe flange eight inches in diameter. A nozzle was built



←

"WAC Corporal" is most spectacular of GALCIT developments. Designed for meteorological soundings, the 665-pound Corporal is launched from 102-foot tower. Tracked by radar on initial test, the 16-foot rocket reached nearly 50 miles.

with a flange matching the motor's flange, and the two were joined with bolts designed to give way if pressure inside the motor became high enough to threaten an explosion. There were lots of explosions.

By the summer of 1941, the laboratory produced its first dependable, small-scale motor, and a satisfactory propellant, called GALCIT 27. The propellant was an amide powder, forced into the motor under 18 tons pressure. The charge weighed two pounds. Unloaded, the motor weighed 10.7 pounds. It delivered a maximum thrust of 28 pounds for 12 seconds.

The Air Materiel Command chose an *Ercoupe* for the first practical test. It weighed 753 pounds empty. Capt. H. A. Boushey made the flight tests at March Field, Riverside, Calif., in August, 1941. After a few preliminary failures, the results measured up to expectations.

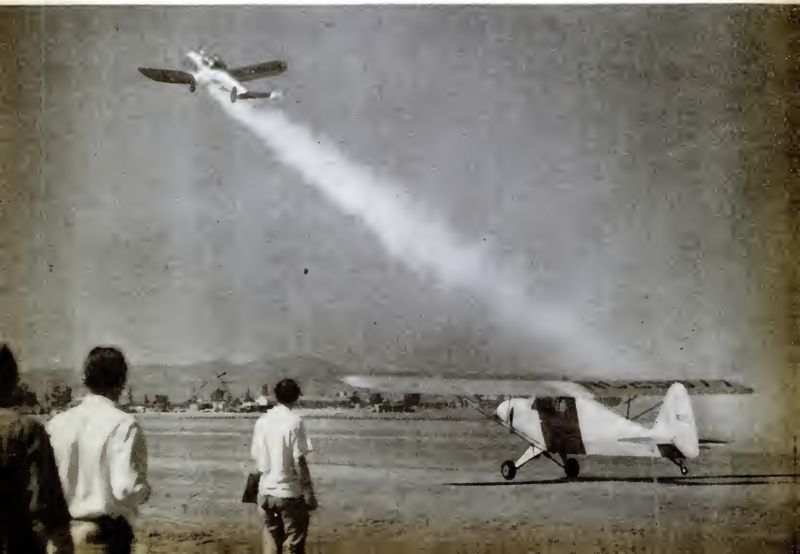
With three rockets under each wing, the *Ercoupe's* take-off distance was reduced from 580 to 300 feet, a saving of 48.3 per cent. The time was cut from 13.1 to 7.5 seconds. Under an overload of 285 pounds, distance was cut from 905 to 438 feet, a reduction of 51.6 per cent, and time was shortened from 18.8 to 9.5 seconds, a saving of 49.4 per cent.

Acting on a report by a Navy officer who witnessed the *Ercoupe* trials, the Navy promptly contracted with GALCIT to produce a jet unit capable of delivering 200 pounds thrust for eight seconds. Because the Navy wanted motors to assist carrier take-offs throughout the world, one of the requirements was that the rocket be adaptable to storage, and another that it work through a wide range of temperatures. *(Continued on page 68)*

Enemy rocket planes, like this denuded Me-163, are studied by GALCIT in the endless effort to conquer time and space.

JATO tests on conventional military planes like this C-54 supply know-how in the development of more powerful rocket units.

Jet-assisted Ercoupe climbs away at 30° angle before conventional take-off (foreground), begun at the same time, is barely under way.



Hack watch is extremely accurate.

Wrist chronograph has four dials.

Master watch has dust-tight case.

Airplane 8-day clock is rugged.

Elapsed time clock has five dials.

Calendar clock tells time and date.

Time and the Airman

By RAYMOND LeKASHMAN

NOT every man you see with one of those jumbo-sized wrist watches is necessarily a show-off. First, the watch is what is known in aviation as a chronograph. Second, it—or whatever timepiece the flyer may have—is as important to the safety and accuracy of his flying as is the gasoline in his plane's tanks, his radio, his last weather report, or the condition of his engine.

No pilot would — nor should — ever take off on a cross-country flight without a reliable aviation timepiece. There have even been emergencies when the very existence of a plane, pilot, cargo and passengers have depended on a timepiece as insignificant as a dollar watch picked up at the corner drug store. The fundamental fact remains: aviation leans heavily on accurate timepieces.

Accurate timekeeping is vital in all phases of aviation. Time is essential to the navigator not only for his celestial observations, but for every problem involving speed and distance. To the pilot or radio operator it is equally important. Aviation timepieces must be extremely accurate and they must have many special features not found in ordinary timers.

Watches and clocks are just as much aviation instruments as altimeters and tachometers. Nevertheless, the average airman knows much less about the mechanical functioning of his watch than he does about an aneroid altimeter. Many flyers are not even aware of the variety of timekeeping instruments which have been devised for specialized aviation uses.

First and in wide every day use is the aviation "hack" watch. It is a sturdy wrist watch with a second-hand which can be stopped. You cannot synchronize the second-hand of an ordinary watch with a master time source. It is extremely important to flyers to be able to make that synchronization. With a hack watch the following procedure is used: as the second-hand comes up to "60," the winding knob is pulled out, stopping the second-hand in

Precision chronograph is used in celestial.

Master chronometer indicates basic time.

Cross-country pilot needs an accurate watch to register his time over check points (such as river below) on course.

Accurate timekeeping has critical importance in all flying activities.

that position. The watch is then compared with the master time source, which might read 0832½. By turning the winding knob, the hour and minute hands are set to 0833. As the second-hand of the master time source reaches "60," the winding knob of the hack watch is pressed back in place, thus re-starting the whole mechanism. The hack watch now agrees with the master exactly to the second, and the watches are said to be synchronized.

Hack watches are subjected to severe stresses in use and must be extremely well built. They are usually water tight and anti-magnetic, and they are so designed that wide changes in temperature and barometric pressure will not seriously affect the rate at which the watch runs. A well-made, properly adjusted hack watch will have an almost constant "rate."

This does not mean that the watch does not gain or lose time; hack watches do gain or lose a few seconds daily. If the watch is known to gain 48 (Continued on page 76)

Precision timepieces for AAF navigation cadets at Hondo Field are kept in dustproof vault to insure accuracy.

Stay Away From

But just in case you run into one, here's the advice of a pilot who's flown in and out of them for 35 years.

A strike may leave you with no means of support.

In no time you will wonder which way is up.

It's a tornado even if it doesn't touch ground.

He can't dodge them all because he can't see them all.

Thunderstorms

By HY SHERIDAN

Captain, American Airlines

"SON, the first thing—or the last—that you'll find out about thunderstorms is you don't know anything."

The old airline pilot was answering his new co-pilot, who was as eager to know how to handle thunderstorms as a sophomore is to know the rules of thumb for handling women. Both problems appear to novices to be simple, so very simple. Besides simplicity, the two problems have something else in common: silence—for earnest students who have learned their lessons are not talking about them. It took me 30 years to find out that I don't know anything about flying thunderstorms or about handling women. Right now I'll talk about what I don't know about thunderstorms.

Everybody seems to know just how to fly thunderstorms except the men who do it professionally. I know that you have read some concise stories about how to fly thunderstorms, written by meteorologists, bell boys, press agents, reporters, and inmates of offices. In a leading trade journal I read a story telling airline pilots exactly how to fly thunderstorms. It was written by a lawyer by the name of McCann. Since then, whenever I get caught in a case of Jove's gastritis, the first thing that I think about is McCann.

These cocktail adventurers tell you just how you can determine by looking at thunderstorms which are nice, tender, lady-like ones, and which are Dame Nature's mickey finns. Such stories are the purest tripe. Let one of Thor's old sparring mates assure you that a thunderstorm is like a woman. You can't tell from the outside what is going on inside.

After 30 years of flying—18 of them with airlines—you might think that I am getting familiar with thunderstorms. Well, there are some things I've learned not to get familiar with, and one of them is the thunderstorm. The attitude that I strive to maintain toward thunderstorms is not one of familiarity but of dignified aloofness.

If you are not an airline pilot, and especially if you are now and then a passenger, you will ask, "Why don't you fly over them?" The reason is that a self-respecting thunderstorm rears up sometimes to 40,000 feet.

Or you will ask, "Why don't you fly around them?" That's an easy question. It's the answer that's hard. Your pilot does, by means of experience and prayer, manage to fly around most of them. He can't fly around all of them. Missing the ones he does outbox is an art. The reason he can't dodge them all is that he can't see them all. A thunderstorm doesn't sit out there alone and prominent, like a belch in church. A thunderstorm sky is packed with all kinds of clouds at all levels. Under some conditions the clouds may be spotty, or they may be on a line, and your pilot can do some looking, planning his open field running. Too often he is flying within the clouds, flying blind. Even when the flying level is not solid with cloud, a dinky cloud right in front of his face will cover up half of creation, and when he passes through that one there sits another, and so the pilot is, in effect, blind. Now you know why airline pilots fly through thunderstorms. The art consists of flying through as few as possible, flying these as the best level, going through the shortest way, picking the softest spot, and never hitting a core or funnel.

You have one more simple question. (I know it is simple because I used to have it asked me by operations managers.) When the pilot sticks his nose into a thunderstorm why doesn't he turn back?

If the one he has mounted is a colt, he need not worry. If it's an outlaw he won't know which way is back. In no time at all he will entertain some doubt as to which way is up. If you want to know just how he feels, you should go to the little Mexican town of Tehauntepec. I did, and I went into the Cantina de los Charros where the barkeep set out a blistered glass of clear liquid, a half lemon, a dish of salt, and a whiskbroom. I asked him what the whiskbroom was for and he said it was to dust myself off with when I got up. . . .

In spite of what I have said, you can usually, by some preternatural utilization of averages, get back and out. But if you are an airline pilot you have to go through somehow, right there or nearby.

Suppose your thunderstorm suddenly gets slappy and twisty. If you believe that your general area is about as soft as you can use (you will have chosen it for that quality) you are going through, but first you turn back and pull out. You pull out simply because you had an indication that you (Continued on page 88)

Why are thunderstorms so dangerous? The author believes they contain hidden tornadoes.

Ferry pilot will completely re-check this Aeronca before accepting plane for his company. The lightplane has already been checked and flight tested by manufacturer.

Pilot movements are recorded on wall map by American Fly-Away officials Leon Wilder (right) and A. E. Morris.

Ferrying costs are figured for a trip by National Aircraft Ferrying's R. B. Hartman (left) and L. H. Aufmuth.

Assigned planes, these ferry pilots of the American Fly-Away Service will take off from the Aeronca factory on special delivery flights. Ferry companies often have factory representatives to speed the departure of airplanes being delivered by their pilots.

AIRPLANES SPECIAL DELIVERY

Ferry services will deliver any plane to your airport.

By KEN DAVIS

A BRIGHT new business, born of young pilots with an idea and the present boom in aviation, now brings the new lightplane buyer his airplane special delivery. As long as airplanes are sold fly-away factory, it looks like these men will stay in business, flying almost every type of aircraft built by U.S. manufacturers thousands of miles every month.

These special-delivery boys put an end to the new owner's problem of figuring some way to get his 'plane from the factory to his hometown airport. Before this service was offered, it was either a case of making a trip to the factory and flying it back yourself or getting a pilot to do the job for you.

The professional ferrying idea has clicked, for there are already at least a half dozen companies delivering lightplanes. They're in Dayton, Chicago, Detroit, New Haven and New York. All these companies offer savings, speed, service and safety, hoping to give it to a majority of the 40,000 lightplanes which will and have rolled from the assembly lines this year. The way it looks now, they will be delivering most of those planes.

Private-plane ferrying is brand new. In fact, one recent purchaser of a lightplane, informed it would be delivered to him by the American Fly-Away Service, Inc., of Dayton, O., innocently expressed his perplexity in this way: "What's that, an insecticide company?"

That customer is now wiser, like scores of other buyers throughout the nation will be before the end of 1946. American Fly-Away, pioneer in the business, already has ferried $500,000 worth of new personal planes since its first delivery in November, 1945.

The Dayton firm, however, is a pioneer with the down of youth still on its corporate cheeks. It was born in 1944, the product of a schoolboy fancy and wartime flight training.

A few years earlier, Andrew B. Waggener of Memphis, Tenn., was fascinated by those long trailers on which new automobiles are hauled cross-country. From that fascination, Waggener—now a vet-

(Continued on page 82)

THE Bellanca Cruisair

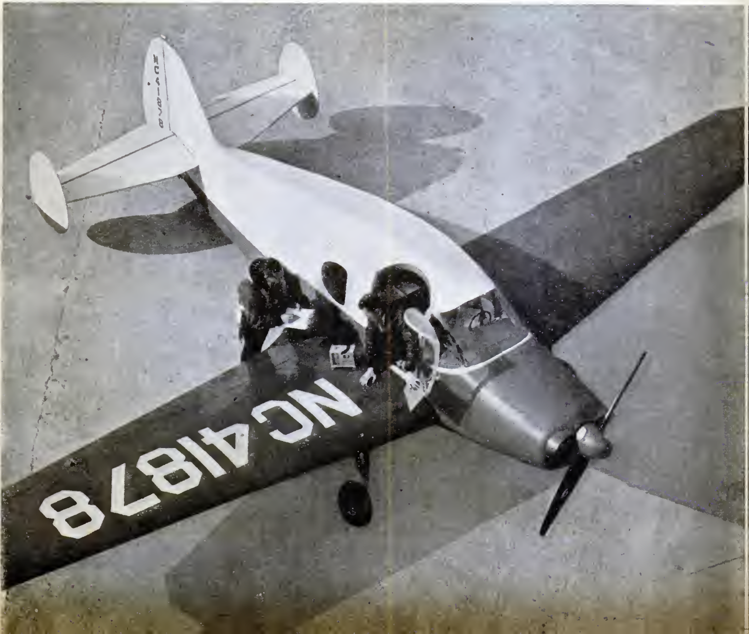
GUISEPPE Bellanca is a sharp man with an airplane design, and everyone in aviation knows it. His single-engined *Airbus, Pacemaker* and *Skyrocket* were—and still are—in a class by themselves when it comes to load-carrying performance. The temperamental, yet retiring, Mr. Bellanca just happens to have a way with an airfoil, and the results are a pilot's delight.

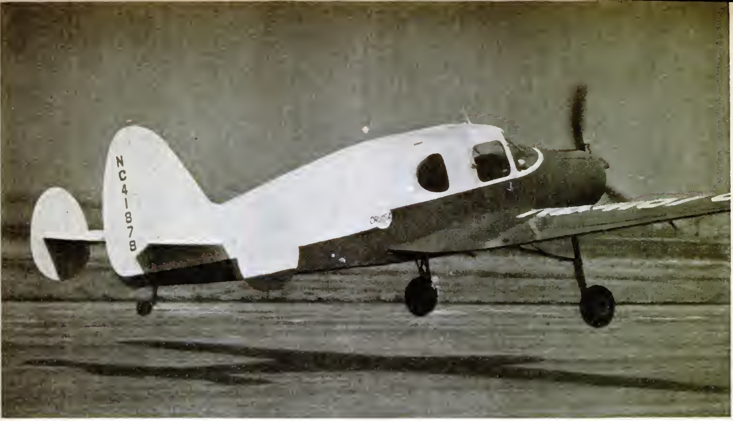
Just before the war Bellanca decided to try for the private-plane market. He came up with the *Cruisair* design, which is still what this 1946 Bellanca is, with more horsepower and a few changes here and there. Though he went quite modern with the *Cruisair* design, the little Delaware designer stuck to the famous old Bellanca wing, with its pronounced curve, square tips and clipped corners. It's the same wing that made such a name for the other Bellancas.

The *Cruisair Senior*, as the 1946 version is known, will carry a man-sized (900-pound) payload over 600 miles non-stop at an honest cruising speed of between 145 and 150 m.p.h. At least, that's the cruising speed I was able to get in the short time I flew one of the new ships, NC-86748. Bellanca claims 153 m.p.h. cruising at 2,435 r.p.m.; I cruised at 2,375 r.p.m. But even 145 m.p.h. cruising—with an airplane that grosses 2,100 pounds and has a 150-h.p. engine—is a respectable performance.

I flew the *Cruisair Senior* (Continued on page 94)

Color scheme of the Cruisair is cream and red. This particular airplane has an automatic propeller, which costs extra.



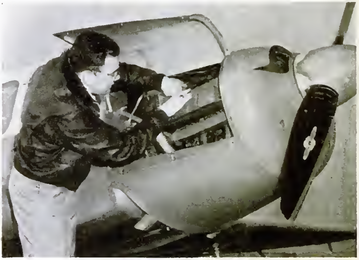


Take-off can be made at 50 m.p.h. Landing gear is operated manually, the pilot having to turn a crank more than 30 turns after take-off to retract the gear. The two tail fins help confine the slipstream to the elevator, aid in directional stability.

FLYING's CHECK PILOT

EDITOR'S NOTE

This series of articles is planned to help the pilot and prospective plane owner evaluate aircraft now on the market. Only aircraft holding a CAA Approved Type Certificate are flown. The author is not a professional test pilot. He evaluates each aircraft through the eyes of an average private pilot who flies an airplane either for business or sport.



Maintenance accessibility is good, the engine cowl opening like that on automobile. Herb Venable, Bellanca pilot, is checking engine.

Entrance to cabin is on right side. Baggage is in compartment behind rear seat. Standard price is $5,950.

Folding wings will pay for themselves in lower hangar rentals and tripled airport storage space.

THE CASE FOR THE Folding Wing

By THEODORE AYERS

IS THE folding wing the answer to the increasingly serious lightplane hangar shortage?

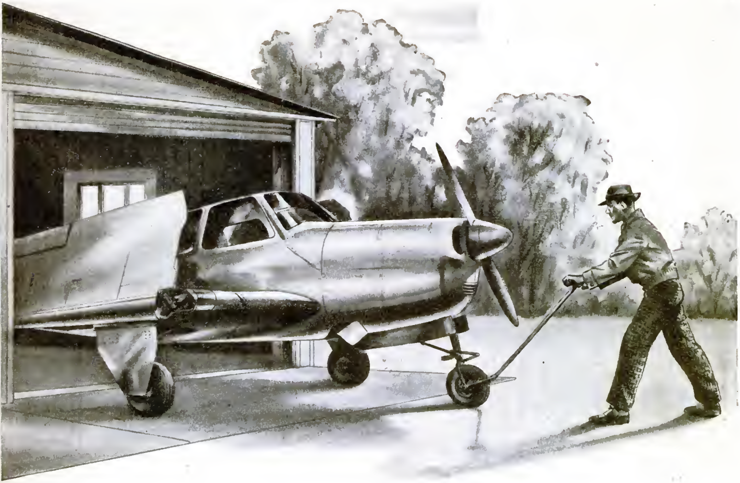
Certainly the folding wing idea has been around long enough to deserve consideration as a possible solution to the problem. In 1909, six years after the Wrights made their first powered flight, patents on a folding wing design were issued in France. The British folded the wings of their Sopwiths and Shorts as early as 1914, and our Navy shortly followed suit. A folding-wing lightplane was built and flown in France in 1922, and one of the feature attractions of European air carnivals during the '30's was competition among designers to develop a plane whose wings could be folded and pushed through a small-sized gate in record time.

On this side of the Atlantic, the folding Fairchild "41" and "71" and the Wallace *Touroplane* appeared in the late '20's, followed by the Kinner *Sportster* of 1935. In 1937, the British even came out with a twin-engined folder, the Horndern-Richmond *Autoplane*. But none of these models gained popular acceptance and today, while folders predominate among Naval fighter aircraft, the designs are either too complicated or too expensive for lightplane application, and uniformly too heavy.

Meantime, hangar space is at a premium. The shortage is aggravated by the trend among Federal housing regulators to reduce "non-essential" building—including hangar construction—to the vanishing point.

"It is an understatement to say that the hangar shortage is acute and growing steadily worse," said one operator recently. "Nobody knows how many years it will be before we can build new ones. The Government is taking all the seasoned wood, required for hangar trusses, and all the available steel. Yet more planes are coming off the assembly line daily." He sees no adequate relief from ready-made hangars now on the market, and points out that their high cost will show up in even higher rental rates for the long-suffering plane owner.

Strengthening the case for the folding wing is a recent study made by John Geisse, former assistant to the administrator for personal flying development at the Civil Aeronautics Administration, showing that a hangar big enough for four standard planes could shelter 10 folders. An acre of hangar takes 16 current models, but could accommodate from 45 to 50 folders, he estimates. In sum, approximately three times as many planes could be sheltered—not to mention three times as much business in gas, oil, and maintenance for the field. Mr. Geisse also estimates that rates could be reduced at a saving of



Family garage would provide adequate storage space for a plane like the Beech Bonanza if its wings were folded in the manner illustrated above. Estimated cost of manually-operated folding wings is less than $200. Added weight is insignificant.

approximately $200 per plane per year. Savings to amphibian owners would be even greater.

Which brings up the main question: can a folder be designed that will be inexpensive, practical, and light enough to solve the problem? The answer from the engineers and designers is a unanimous yes—providing the public creates enough demand.

A poll of leading lightplane engineers brushes off the cost problem by quoting $200 as the highest estimate for a manually folding wing—exactly the Geisse figure on savings to a plane owner in a year. From then on, his folder would be saving $200 a year for him in storage costs.

The consensus of engineers and designers is that folding wings could be designed in a number of ways without upping costs too high. Best type, they feel, would be a strut-free, single cantilever, low-wing monoplane (*Ercoupe*-style) with the main spar hinged or fitted with an eccentric joint and with an additional locking attachment forward of the pivot.

To get the full benefits of a folder, the experts say that the wings when folded should protrude no wider than the tail assembly and no higher than the highest point of a line between the top of the propeller arc and the peak of the rudder fin. This is best accomplished by folding and

Aircraft carrier is prime example of value of folding wings. Carrier could handle only one-third as many fixed-wing planes.

EARLY AIRCRAFT PROVED UTILITY OF FOLDING WINGS

British Autoplane was the only twin-engined folder that came into practical use. It was built in 1937.

Fairchild 71, medium transport, adopted folding wings in the late 20's. The model still is being used today.

De Havilland Moth, British biplane, had folding wings 20 years ago. Slotted wings made plane spin-resistant.

Wallace Touroplane was popular U. S. folder model back in 1927—but cost was too high for private pilot.

"twisting" the wings back on an eccentric so that they come flush against each side of the fuselage with the chord perpendicular to the ground.

Another way would be to fold the wings back horizontally, but this takes up far more ground area, and would probably necessitate additional hinging so that flaps could be folded over on top of the wing to give a 90° pivot aft.

A third method has been suggested by Daniel R. Zuck of Los Angeles in some speculative sketches of a high-wing monoplane with wings folding back, one on top of the other, above the fuselage. This would be ideal for getting the wings completely out of the way, but probably more difficult to operate, and more expensive. It would entail lifting one wing straight up several inches in order to get it over the other. Potential damage to control surfaces would also be a problem which could be eliminated only by a fairly elaborate system of rods and stays to prevent the wings from bumping against one another.

A. A. Vollmecke, chief engineer at CAA, favors one main hinge or eccentric joint together with a multiple-purpose locking bar or pin to fold the wings back. The lock could be designed with a handle outside the wing, either fixed or detachable, like an automobile crank, or it could be reached through a Dzus-fastened well in the ring.

Every expert is agreed that no safety factors would be sacrificed in the air by jointing the wings. Navy reports no more trouble with folding-wing craft than with conventional types.

Nor are the engineers particularly bothered by the problem of adding weight. On the low-wing PT-19A, Armand J. Thieblot, chief engineer at Fairchild, reports that with the center section already present in the design, no more than 15 pounds of fittings would be necessary to convert to a folder. Indeed, by redesigning the wings of most current models on a hinge or joint principle, there would be a good chance of getting the extra weight even lower. Best type for weight-saving is the low-wing cantilever monoplane. A high-wing cantilever monoplane also would be adequate, but a semi-cantilever with struts would be a tough proposition requiring many extra, weight-adding fittings.

All engineers are agreed that if a folder were designed to fit lightplane needs it should not encourage roadable aircraft enthusiasts to throw their hats in the air. Two new problems would immediately arise when taxiing—cross winds and visibility. Piper Aircraft, after much wartime experience hauling gliders overland, found that they made an ungainly package when being towed or taxied. Side vision would also be extremely limited on the majority of planes with wings folded.

But whatever the difficulties in connection with building aircraft with folding wings, the consensus among the engineers is that they are on their way. Airport acreage shortage, hangar space shortage, and high storage rates—all are factors that make the future of the folding wing seem brighter in the lightplane field than ever before in the history of aviation. To quote one of the most far-seeing of the experts, Alfred Marchev, president of the Republic Aviation Corporation:

"There is no doubt in my mind that it is only a matter of time—a month, a year, 10 years—but we will eventually *have* to have folding wings." END

Indian basket makes ideal hamper to help girl flyers stay within weight allowences.

Two Gals and a Plane

By

DOROTHY ("GYPSY") NICHOLS

Mix two girls, a plane, and wanderlust, and you have the formula for a modern adventure.

SOME PEOPLE will say I'm crazy, but I think it's just the other way around. Anybody who doesn't learn how to fly and buy a small plane, then take off for everywhere, is just plain crazy. All this solemn male talk about cost-per-mile and upkeep is so much prop-wash.

I fly with Frances Horne. Fran is my girl friend and never had flown till I took her up after I got my private license on November 24, 1944, at Ford-Lansing (near Chicago), Ill. Since then we have flown about 20,000 miles all over the country—a total of 236 hours—and we've never experienced a dull moment in all that time.

Fran is from Gary, Ind. She was graduated from the high school there. I was graduated from high school at Merrillville, Ind., in 1941. My folks live at Crown Point, Ind., where my father runs a chicken farm. He doesn't like the flying machine much and my mother is so scared of it that she talked all five of my brothers out of flying; the three of them that were old enough to go to war wound up in walking jobs in the Army, Navy, and Marines. While my mother wasn't looking I learned to fly and she's not as mad about it now as she used to be.

I was taught to fly by Fred O. Perkins, an old-timer

Gypsy swings prop for take-off on another lap of their flight around the country. Girl Friend Frances Horne is in the cockpit.

To finance flying between cities, the girls have to go to work. Here Gypsy waits table while Frances cooks short orders.

who learned aviation when it was really dangerous and served in the AAF till he was medical-boarded. I learned, soloed and got my license in November, like I said, but it took the rest of the winter to get enough money to buy a plane for myself.

I bought a 65-h.p. Aeronca, model L-3B, powered with a four-cylinder Continental engine. Like Fred Perkins, it is a veteran of the AAF, reconverted. We named it *Gypsy*. *Gypsy* had 130 hours when I got her and cost $1,650 and she was in swell shape and still is. All the repairs I've ever had to make were to a damaged tail wheel, replacing a piece of plexiglas that popped out, and a 100-hour overhaul, which I wangled for $56.

Well, after I got my private license I couldn't see any sense flying around the same airport all the time, so on April 3, 1945, Fran and I took off from Ford-Lansing and headed south. We've been going ever since.

That brings me to one of the objections that everybody raises to traveling in a light airplane—how can you take along enough clothes when weight is such a factor? But like all the other objections, it's what I said a little while ago, a lot of prop-wash.

I hate figures, but Fran and I worked it out together, and the score is something like this: weight allowance for two passengers, 185 pounds each, or 370 pounds; allowance for baggage, 10 pounds; total 380. Weight of one person (me) 125 pounds; weight of passenger (Fran) 125 pounds; weight of luggage, 70 pounds; total 320 pounds. That leaves a margin of 60 pounds for extras, which with us is mostly souvenirs and presents for the folks back home. Everywhere we go we buy presents like crazy. If you ask me, that's the most expensive thing about traveling in airplanes, buying presents. You get to so many places and see so many swell things that you'd never see at home and the first thing you know you're broke.

Clothesline makes any airport a home to girls who have flown 20,000 miles in 18 months. A bucket serves Gypsy as wash tub.

With our luggage allowance—35 pounds each—Fran and I have enough to go anywhere and dress for the occasion. We carry our stuff in two small handbags and two baskets we picked up while shopping in Mexico. Each of us has two pairs of shoes, two dresses, two or three blouses, two sweat shirts, one suit, one topcoat, one pair of jodphurs, one pair of slacks. We share an electric iron and cosmetics.

After Fran and I got started we decided to go to Texas and have a look around. We worked out a system. We'd be in a restaurant, or working, or in a movie. "Let's go someplace else," I'd say, and we'd rush to our room and pack in five minutes, and go out to the airport and take off. Sometimes we'd decide where we were going and sometimes we'd just cruise around till we found a nice place. It doesn't really make a lot of difference, at least in this country, because most places are nice that we've seen and we've been in a lot of them. Our route so far has gone from Ford-Lansing to Brownsville, Tex., Austin, El Paso, Phoenix, Ariz., back to San Antonio, Tex., then to Baltimore, Md., plus intermediate points and side trips.

This system of ours is a good system even if it doesn't always work perfectly. Sometimes we've started too soon and gone broke along the way, which leads to complications. Another thing, if you fly that casually, sometimes you get lost. But there's one thing I can't understand—why anybody should object to getting lost in an airplane? We've been lost many times and have made a number of emergency landings, and every time we've wound up having more fun than if we'd found our field and sat down calm and collected.

One thing is, when you sit down in a corn field, a long way from an airport, you usually meet people who are delighted to see you, because it's seldom an airplane pays them a visit. Like the time we were flying from East St. Louis on a compass heading to Iberia, Mo. We got low on gas and couldn't find Iberia and finally buzzed a little town we saw off to the right. So we landed in a pasture near the town and the next thing we knew every citizen of St. Elizabeth had come by truck, horseback, muleback, bicycle, and automobile to see us. They were so happy about the whole thing that we could still be visiting them if we hadn't wanted to get on our way

Another time we ran into a storm over the Georgia swamps and had to sit down in a field next to a peach orchard near Macon. There were no people around. We had to walk for what seemed miles through peach trees before we reached a farm house. But when we did, again we received a hearty welcome. It was almost as enthusiastic as the one we got when we landed in a field in front of a school at Johnson City, Tex., when the whole school, including teachers, came out to celebrate.

Two other emergencies we made in Texas are among our favorites. On the first we were trying to make Brownsville by sunset and ran out of gas because of headwinds. So we sat down at the 4-G ranch and for one of the best over-nights of all our travels. It had a private swimming pool, a lovely mansion and a perfectly swell Southern-hospitality host— (Continued on page 100)

How to fly in Mountains

By
Maj. William D. Madsen
Adjutant, Colorado Wing, Civil Air Patrol

MOUNTAIN flying is risky business, in the opinion of most plainsmen pilots. But those who learned to fly at mountain airports insist it's not unduly hazardous; that, what's more, it's a lot of fun. All it requires, they say, is a general understanding of the way air currents move over mountains and the knack of adapting that understanding to basic flying techniques. Add to this some knowledge of the specific area over which he is to fly and the average pilot need feel no hesitancy about seeing "the other side of the mountain."

Upon this very premise, Colorado members of the Civil Air Patrol—with co-operation of state aeronautics and

Flying an updraft, author's Cornell gets extra lift for this west-east crossing of a Rocky Mountain pass.

Stay out of that mountain pass until you learn these rules

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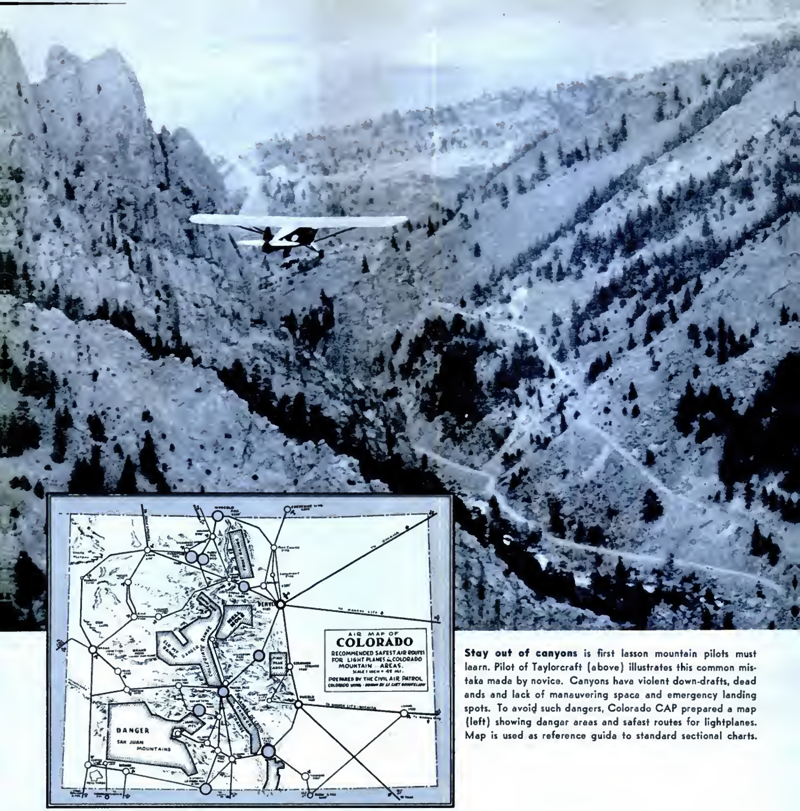


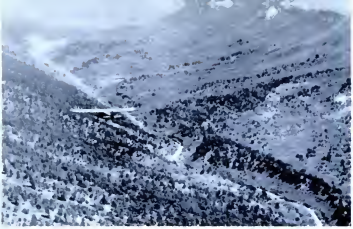
Stay out of canyons is first lesson mountain pilots must learn. Pilot of Taylorcraft (above) illustrates this common mistake made by novice. Canyons have violent down-drafts, dead ends and lack of maneuvering space and emergency landing spots. To avoid such dangers, Colorado CAP prepared a map (left) showing danger areas and safest routes for lightplanes. Map is used as reference guide to standard sectional charts.

state highway departments—surveyed and mapped what we consider the safest Rocky Mountain routes for the lightplane pilot. Besides providing 5,000 such maps, a major goal of the project was to compile a simple list of rules to guide the novice in mountain flying.

In gathering such information, William B. Nelson, supervisor of aviation for the state aeronautics department, and I made a trip in a CAP-owned Taylorcraft to most of Colorado's mountain airports. We interviewed personally more than 75 pilots, fixed-base operators, and airport managers—all experienced mountain flyers—asking specific questions designed to elicit general information about mountain flying as well as that pertaining to Colorado in particular. Here are the questions and what I believe to be rather concise condensations of the various answers.

1. What do you recommend as the safest lightplane routes from your port to principal towns in Colorado?

The map shown incorporates the various answers given. Only routes considered safest were mapped. There was general agreement that best routes for lightplanes are not direct courses from home port to destination. The safest procedure is to follow valleys (*Continued on page* 64)



Ridge-flying technique is shown by Funk pilot. With wind from lower right to upper left, he utilizes updraft at edge of ridge.

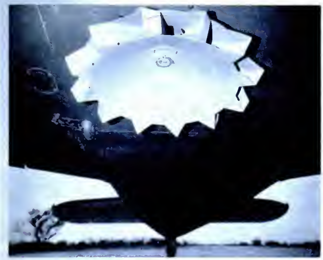
Caught in downdraft, Cornell pilot flying edge of ridge must drop nose, turn left and regain speed over lower canyon bottom.

Lookout stations are important check points. Colorado plans to use them in radio network to give in-flight weather reports.

Power-on landing made by this Taylorcraft pilot is proper mountain technique which minimizes stall danger at high altitudes.

Emergency landing areas include clearings, meadows and valley floors. In midwinter, this Luscombe pilot could use the frozen top of mountain lake just ahead.

Pre-measured quantity of pellets is raised by hydraulic power and poured into hopper of waiting twin-engined Cessna.



Seeding mechanism has 12 wind vanes, each connected to the feeder magazine. Whirling vanes spread pellets evenly.

Flag-bearing Indians are stationed at either end of three-mile "rows" to mark course pilot flies. Indians then move 250 feet to establish a new row.

Dr. Lytle S. Adams (above) inspects seed pellets flowing into hopper which holds same amount as the planting plane's magazine. At right he examines experimental plot of drought-resistant Lehman's Lovegrass set on Papago Indian Reservation a year ago.

Buckshot Air Planter

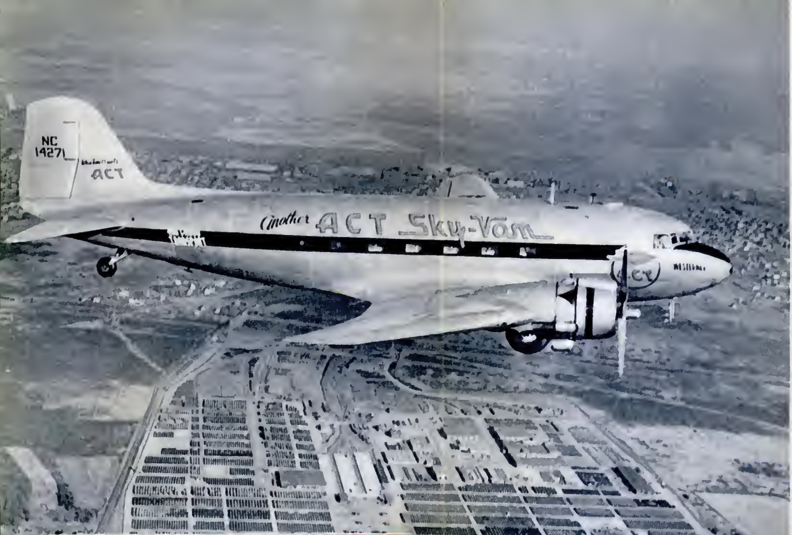
Ingenious aerial planting system sprays waste lands with fertilized, seed-bearing pellets.

FLYING low over the barren San Carlos Indian Reservation of Arizona, the Cessna pilot was following imaginary three-mile rows. Marking the rows at either end stood a mounted Indian bearing a red flag. As the plane flew along the rows it bombarded them with tiny mud pellets which soon would sprout into a crop of hardy desert plants.

The first seeds were strewn from airplane as far back as 1924. They did not do so very well. They refused to germinate or were destroyed by animals, birds, sun and fungi. Dr. Lytle S. Adams, father of the present Government-sponsored seeding program, has developed seed-bearing pellets to overcome these difficulties. A versatile genius who also invented the air mail pick-up system, Dr. Adams developed a machine to mix the seeds, fertilizer and pest repellants with native earth and turn them out in precise little nuggets whose distribution can be controlled.

Experiments now under way contemplate seeding much of the arid west with Lehman's Lovegrass, an African grass that thrives under dry conditions. After that, crested wheatgrass and even flowers and vegetables will be seeded. But the biggest pending project is reforestation in areas where seed crops no longer exist.

Adams' pellet machine can turn out 18,000 pounds of seed-crammed pellets per day. The twin-engined Cessna easily carries a 700-pound load on each trip. The rotating wheel under the plane's belly sprays them fanwise at measured intervals. The machine is so effective now that Adams, with a crew of seven, undertook to reseed 50,000 acres in less than a summer. Yet he believes that with more efficient flying equipment he could do the same job in three to five flying days. Savings of $1.60 per acre in reseeding alone are expected. For reforestation they may go as high as $11.50 an acre. END



One of 15 C-47s operated by Air Cargo Transport Corporation. These planes are called "Sky-Vans" and fly cargo exclusively.

Maine lobsters are shipped everywhere by air. ACT President H. Roy Penzell shows packing method to Employee Dorothy Weston.

The Vets fly the Freight

By
JOHN W. LANCASTER
New York Editor of FLYING

Havana-bound cargo is tied down securely before take-off from Newark airport. Successful cargo airline management requires developing two-way loads so planes will not have to dead-head back. This plane may return with sun-ripened fruits and tropical flowers.

Veterans are key figures in scores of new air-cargo operations. Here's the story of a successful one.

ACT stands for Air Cargo Transport Corporation and it is distinguished from other veterans' airlines mainly by three factors: it is the biggest, it is the oldest, and it flies cargo only—no passengers. It is typical in its rapid growth and in the predominant part veterans take in its operation.

ACT set out with two Lockheed *Lodestars* a year and a half ago and this summer was flying 20 C-47s. Ninety per cent of its employees are ex-service men or women.

This expanding business was started by H. Roy Penzell, a 36-year-old human dynamo who made a fortune in business before his long-standing interest in aviation got the better of him and he decided to ride his hobby instead of play with it.

Penzell was a private flyer with better than 700 hours when the war started. He was running a dress business known as Sports Vogue. During the war he operated 11 factories and kept on flying as a CAP pilot with the Miami anti-submarine patrol. The heavy wartime aerial traffic through Miami convinced Penzell that commercial air-freight had a peacetime future.

His first employees were veterans, hired "not for sentimental reasons but because they really get a job done," Penzell is careful to explain. These same employees, it should be added, are also encouraged to buy into the company and to date more than a third are share holders. Penzell himself is so enthusiastic about the venture that he did not accept a salary as president of ACT for the first year.

Penzell learned to fly while in college. After being graduated from New York University he went to work for a large industrial advertising company which handled such accounts as General Electric and American Radiator. During the World's Fair in New York Penzell formed his own company and handled promotion for the Aviation Building and the Sky Traffic Diorama.

As a contract carrier, ACT is flying about 50,000 New York newspapers to Washington, Cleveland, Detroit, and

Exactly 6,500 dresses (left) are all carried in a single ACT load. The advantages are obvious; moderate costs, no packaging, fastest possible delivery. Below, an ACT co-pilot checks the temperature for shipment of 4,000 pounds of frozen frog legs from Cuba.

New York newspapers are loaded for shipment to Washington (left). ACT flies about 13,000 pounds of New York Times and Herald-Tribunes daily at low contract costs of 20 cents per ton-mile. Comparable air express rates on scheduled airlines are much higher.

Chicago daily at a rate of only 20 cents per ton mile. An ex-Navy commander and 3,000-hour pilot named Jack Barrington is heading up ACT's research department to find out where the best air cargo business can be found.

All this is now paying off in more business for ACT. Barrington's surveys cover not only the United States but the Caribbean area, including Cuba and Venezuela. Traffic is a two-way affair. Cubans are interested not only in sending avocados to the United States but in buying piece goods, vitamins, and other products from the United States.

The crux of the air cargo problem is simple—get the goods to market fast—and profitably. The key to profits is in extent of plane use. Planes have to work a good many hours to pay for themselves. Penzell figures that an air cargo line must have at least 15 planes to do a job. Utilization of aircraft is the important factor. The goal is clear: get the business and ACT's "veterans" will fly it. END

REPORT FROM WASHINGTON

By FRED HAMLIN

ANNOUNCEMENT

The editors of FLYING will produce a daily four-page newspaper called the FLYING DAILY at the National Aircraft Show in Cleveland, O. The FLYING DAILY will be distributed to members of the aviation industry at the show each morning from November 15 to 24 inclusive. The paper will be produced by members of FLYING's editorial staff and will contain news, photographs and information of interest to participants in the show.

IF YOU happen to pass a plane in the air with nobody in it, think nothing of it. Its cockpit is doubtless loaded down with a sea of gadgets which Navy developed during the war to test remote control or, with a pilot in the cockpit, to give aid in his observations. Navy calls the two systems involved radio- and television-telemetering. The systems give a pilot 68 different and almost instantaneous views of his ship while in flight—and he doesn't have to look at anything. If that sounds like a gag, it's the simplest way we could say that the 68 views are recorded on the ground by television. Ground observers can radio the pilot if anything goes wrong—even before he has had time to become aware of trouble. The instruments also record trouble if he has to bail out. They can be coordinated for a remote-control, no-pilot test if the plane in question promises to be a trouble-maker in the air. . . . Credit for the systems goes to the research laboratories of Curtiss-Wright, working during the war under a Navy contract. Since the war, the research has been transferred to the Cornell Aeronautical Laboratory at Buffalo, with the understanding that special future emphasis will be placed on pilotless aircraft and flying missiles.

Airport Ban

Remember our mentioning that the National Park Service doesn't like visiting lightplane pilots? That's exactly right, according to J. H. Campbell, trustee of the Seattle unit of the Aircraft Owners and Pilots Association. Campbell wires:

> AOPA PILOT ON FISHING TRIP TO PESAYTEN FOREST SERVICE FIELD 100 MILES NE OF SEATTLE ORDERED OFF FIELD AT 7 PM SATURDAY. NECESSARY TO RETURN TO PAINE FIELD AFTER DARK. PESAYTEN BEING USED BY FOREST SERVICE PLANES REGULARLY. AREA NOT CLOSED TO PACK TRAINS OR PEOPLE ON FOOT. OUR MONEY BUILT FIELD. WHY CAN'T WE USE IT? ARE ALL FOREST SERVICE FIELDS CLOSED TO PUBLIC? APPRECIATE IMMEDIATE ACTION TO OPEN FIELD FOR REST OF FISHING AND HUNTING SEASON.

AOPA's Washington headquarters went into immediate action, as Mr. Campbell suggested, but last we heard they were getting nowhere fast on opening Pesayten or any other Park Service field to the public.

Hoppicopter

You'll undoubtedly hear a lot more about this as time goes by, but here are a few details received from the West Coast on the Pentecost Hoppicopter. The name concocted by its inventor, Horace T. Pentecost of Seattle, derives from the smallness of the craft, which is a sort of an aerial motorcycle. Specifications include a 35-h.p. Righter engine and a 15-foot rotor diameter. Promised performance: landing and takeoff in a 20-ft. square, 250 pounds capacity (the machine weighs only 125 pounds), maximum speed 90 m.p.h., 200 mile range on four gallons of gas, maximum ceiling 12,000 feet. Pentecost expects to sell his machine for less than $1,000 to messenger services, patrol workers, and (we've discovered recently) our 10-year-old-boy. Inventor is from Boeing Aircraft Co.

Surplus Planes

California leads the nation in the number of aircraft purchased from the War Assets Administration, according to a recent summary. More than 16,000 planes have been sold, according to the report, with California purchasing 2,782. Texas was next with 1,744; Vermont last with nine. . . . Perhaps more interesting are the figures on the 10 ranking counties in WAA aircraft sales. Los Angeles county, for instance, bought 1,753 planes—more than all of Texas combined. From this high the figures drop sharply to Dade County, Miami, Florida, second with 395 purchases. . . . Aviation enterprises bought almost twice as many planes as did private flyers—10,211 went to enterprises, 5,116 to individuals. Primary trainers got the biggest play, with 7,479 customers. A total of 3,253 liaisons were sold, 2,980 basic (Continued on page 98)

Telemetering equipment in pilotless Helldiver transmits flight data to radio truck where it is recorded and later interpreted.

I Learned About Flying From That! NO. 84

The author in 1934, with the little Aeronca he flew blind.

By ELLIOT G. OBERG

Flying blind by the tilt of a compass card almost cost this brash young pilot his neck.

IT WAS a warm, quiet afternoon at the old San Francisco Bay Airdrome in Alameda. The time was July 5, 1934. There were only two or three planes in the air as two friends, John Waage and Paul Ritter, and I sat chatting with our backs against the hangar door. I listened as they talked.

They were discussing instruments for blind flying and the need for having adequate experience with them before attempting any flights that would require blind flying.

Both of my friends had had considerable flying experience, each holding a transport license as well as an A & E license. I was—in my mind—a seasoned, experienced aviator, with six solo hours.

John had been my instructor, having given me all of my dual and taught me all that I knew about flying. I asked him if he didn't think that it was foolish to have to use instruments when everyone knew that experience taught a person to fly by the seat of his pants? He told me that sometimes you can fly blind without instruments and get away with it, but the senses can't always be trusted and it's so easy to get mixed up, when you can't see, that a person is foolish to try it.

Being full of confidence in my own ability to handle a plane under any circumstances, I didn't argue with him but I kept thinking that I could safely fly blind—and use nothing but a compass.

I figured that by watching the compass heading I could stay on course and by watching the way the compass card tilted from one side to the other and up and down I could keep the plane on an even keel even if I had no horizon as a guide. The more I thought of it the more convinced I was that I would show them that it could be done.

The morning had been overcast with overhead fog giving a ceiling of about 400 or 500 feet. Getting up early the next day I went out to the airport before anyone else was there and prepared to make my experiment.

I took the plane — the pride of the flying school — out of the hangar and started the engine. It was a little, two-place Aeronca C-3 with a two-cylinder engine. I went over my plans as the engine warmed.

The Aeronca's instruments consisted of an engine oil pressure gauge, a tachometer, altimeter and compass. I set the altimeter to zero on the ground and the others looked okay so I took off and climbed for altitude.

I was about over Neptune Beach when I reached the ceiling—it was just about 500 feet. I leveled off in the clear and headed the plane on a northwest heading so that I would fly in the direction of Berkeley and yet not run into the hills in case I should miss my timing a little.

When I was squared away on my course I pulled up in a slow climb until I was about a hundred feet up in the fog and then leveled off by watching the level of the compass card.

I figured that if I held my course for 10 minutes I would come out just about at the Berkeley waterfront so I held carefully on the heading and was doing fine. Several times I hit updrafts and a wing would drop but the compass card went off of level and I immediately leveled off to compensate. At 10 minutes by my wristwatch I pushed the stick forward to come out in the clear and see how I had made out.

At 500 feet I broke through the fog and was elated to find that I had come out exactly where I had planned. I really felt that I had discovered something good.

I turned around, headed for Alameda and again pulled up into the fog for the return trip. The 10 minute return was uneventful and by the time I figured I was over Alameda I felt right at home in the fog and the whole thing had seemed so simple that I decided to try something more difficult than straight-away flight. I would make my approach in the fog and come out of it lined up with the field so I could land without any maneuvering.

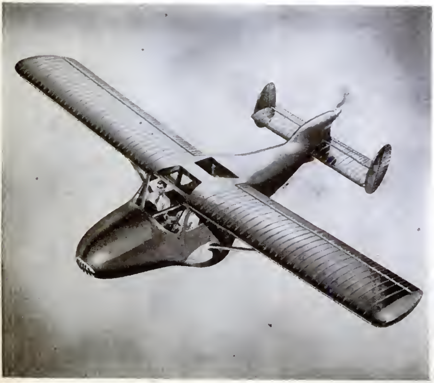
I made what I figured to be a 90° left turn for the first leg of my pattern and then leveled out again. I noted that the altimeter showed about 700 feet so I figured that everything was still going good. Then I noticed that the tachometer showed an increase in engine speed and pulled back the throttle to slow it down, thinking that the throttle had just crept open.

Suddenly I noticed that the wind was whistling through the flying wires in a higher tone than usual. Thinking that I was in a dive I pulled back on the stick to bring the nose up and slow down my speed. Not having an air speed indi-

(Continued on page 80)

HAVE YOU SEEN?

Aeronca Chum, new two-control lightplane, has 85-h.p. engine, cruises at 105 m.p.h. for 400 miles. It is two-place, weighs 1,400 lbs. loaded, lands at 49 m.p.h., does not yet have ATC. Chum is built under license from manufacturers of Ercoupe.

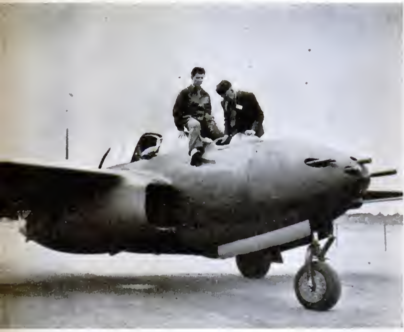


Waco Aristocraft is another two-control design, with 215-h.p. engine. It seats four, cruises at 152 m.p.h., stalls at 55. Engine is in nose, propeller in the tail.

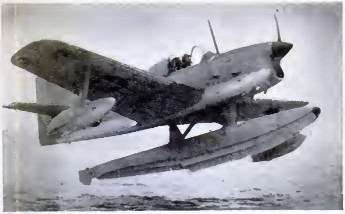
New propeller developed for giant XB-36 by Curtiss has improved blades and feather-reversing mechanism.

HAVE YOU SEEN?

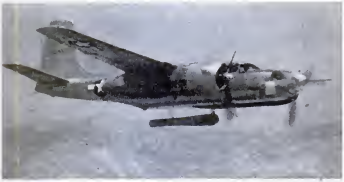
(Continued)



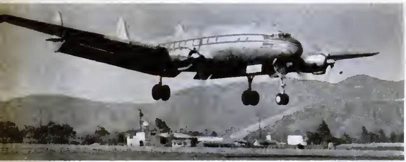
Two-place Airacomet (YP-59A) can carry instructor or passenger. At Schenectady recently it carried first air mail flown by jet plane.



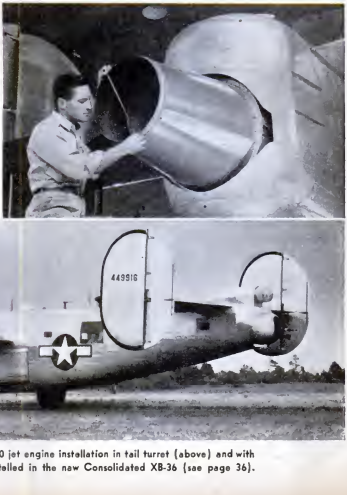
Edo XOSE-1, Navy observation-scout, has 550-h.p. Ranger engine, 1,000 mile range. XOSE-2 is two-place version of same plane.



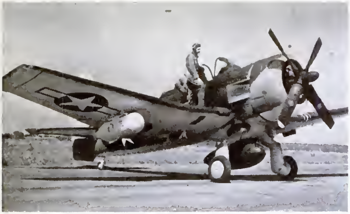
Buzz-bomb motor on Marine Corps' A-26 boosted speed to 475 m.p.h. in test made at Naval Air Station, Mojave, Calif.



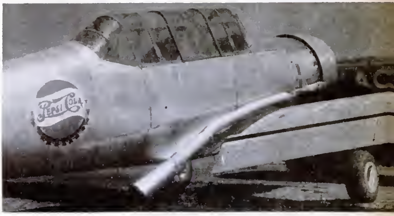
Tri-motored Constellation was flown coast-to-coast in 11½ hours. PAA plane made recent belly landing. Damaged engine was removed.



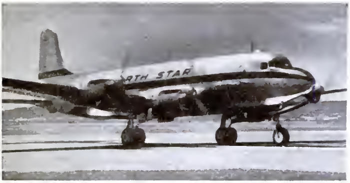
Experimental Liberator used by General Electric is shown with I-40 jet engine installation in tail turret (above) and with a new radar-controlled tail turret. This turret is similar to that installed in the new Consolidated XB-36 (see page 36).



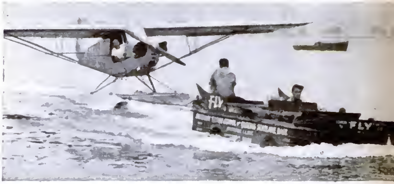
Latest Curtiss Seahawk (SC-2) has 1,425 h.p., cruises at 157 m.p.h. Range is 1,165 miles, span 41 feet. "Bomb" on wing is portable radar.



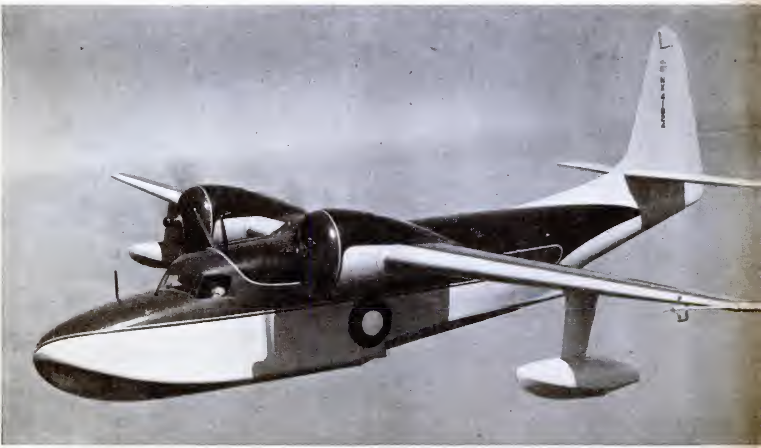
Sky-writing BT-13 carries 55 gallons of "smoke" in back cockpit; can write six signs non-stop at 12,000 feet. Long pipe blows smoke.



Canadian DC-4 has 1,740-h.p. Merlin engines which give it cruising speed of 325 m.p.h. at 22,600 feet. It was built in Canada for airline.



Surplus Weasel is used by Queen's Seaplane Base in New York for towing its planes. Weasel pulls planes right up on ramp from water.



Grumman Mallard has two 600-h.p. engines, carries 10 passengers about 1,000 miles at 180-m.p.h. cruising speed. Span is 66 ft. 8 in., gross weight, 12,500 pounds. Mallard is for feeder-line or executive use, will sell for $90,000. It stalls at 71.

LONDON LETTER

Avro Tudor has been selected for commercial tests of British turbojets which author claims are best yet produced.

By Maj. OLIVER STEWART

British Authority, Editor of Aeronautics

PERSONAL flyers in Britain are waiting with special interest to see how the small jet engines which the Royal Air Force is to use on trainer aircraft will perform. Thus far the jet tendency has been toward larger and larger sizes and bigger thrusts. But some makers are now working on small units. Rolls-Royce, Ltd., for instance, have the *Dart*.

Details concerning the *Dart* had not been released at the time of this writing but it is known to be a smaller, simpler version of the *Clyde*. The *Clyde* is the most complex jet unit yet built. It has co-axial shafts, both axial flow and centrifugal compressors and multi-stage turbines. The new jet unit also drives counter-rotating propellers.

Rolls-Royce has been working on propjets because the need for them may last for some years. But the company's chief jet engineers are strongly in favor of dropping the propeller and going all out for the turbojet.

Jet Tudor

Large-size turbojets are being tried in many standard aircraft, among them the *Lancaster* bomber and the *Tudor* civil transport. The *Tudor* trials have been discussed for some time but it has only recently been made known that the jet units are to be Rolls-Royce *Nenes*.

No one expects aircraft of these kinds to be well suited to turbojets and the tests are more to build up knowledge of the behavior of the engines than to boost the performance of the aircraft.

It is known that Britain is far ahead of the rest of the world in the design, construction and operation of jet units and great effort is going to be made to keep up the rate of progress, increasing it whenever possible.

State Aviation

Royal assent was given recently to the Civil Aviation Bill of the present British government. This means that the bill becomes an act and has the force of law and that British aviation will in future be mostly state aviation.

Charter flying and personal flying have not been taken over by the government but the charter operators won't be allowed to "threaten the interests" of the three great subsidized concerns.

To meet new conditions created by this new law the Ministry of Civil Aviation has been partly reorganized. Most interesting of the new appointments is that of Peter Masefield who is to be head of the new "long-range-planning" division.

This reorganization of the Air Ministry suggests that the rumors of a merger with the ministry of transport were incorrect. But it is known that some of the members of the cabinet favor that arrangement.

Peter Masefield was the first civil air attache at Washington. He was formerly with *The Aeroplane*, British aviation journal, under Charles Grey. He then became technical assistant to Lord Beaverbrook in the ministry of aircraft production.

Numbers

Sometimes it appears that in Britain there is more talk about aviation, more committees discussing it, than there is actual flying. But the number of civil aircraft in use is going up. Unofficial reports

(Continued on page 100)

G/C Douglas Bader, legless RAF ace, was one of many British flyers who visited Deauville air meet.

Here's **Everything**

you've wanted in a brake!

To private flyers the Goodyear Single Disc Brake is the answer to a prayer..No other brake combines so many major advantages. It is exceptionally powerful, velvet-smooth, non-fading—yet amazingly compact and light. It is self-cooling; protects tires, tubes and linings from excess heat. It is *self-adjusting;* "pedal feel" is always the same; linings give longer, more uniform wear. All parts are readily accessible—*relining takes only a few minutes!* Service and parts available from leading supply dealers at airports everywhere. Already adopted by many of the newer, faster personal, military and commercial ships. You'll want it on your new plane, along with time-proved Goodyear tires, Pliocel safety fuel cells, and Airfoam cushioning that ends flight fatigue. For information write: Goodyear, Aviation Products Division, Akron 16, Ohio or Los Angeles 54, Calif.

GOODYEAR
AVIATION PRODUCTS

More aircraft land on Goodyear tires than on any other kind

Pliocel, Airfoam—T M 's The Goodyear Tire & Rubber Company

AOPA NEWS

Aircraft Owners and Pilots Association is a service organization for the private pilot or aircraft owner. AOPA's full time staff is devoted to helping the individual pilot. Its aim is: "To make flying more useful, less expensive, safer and more fun."
Headquarters are: 1319 F Street N.W., Washington 4, D. C. Members also receive a special "AOPA" edition of FLYING, newsletters and confidential aviation data. Opinions expressed in this column are not necessarily those of FLYING Magazine.

INSURANCE SERVICE FINEST

AOPA's services to its private pilot and aircraft owner members made a great forward step a few months ago when it provided them an insurance participation service. One of the benefits of this step which meets a fundamental AOPA aim—"to make flying less expensive" as well as safer, more useful and more fun—is apparent in the following letter to the association from a pleased member:

> Gentlemen:
>
> I just thought I would write you to express my gratification over the excellent and prompt manner in which the claim for damages to my plane was handled . [when it was damaged] . . . by a windstorm.
>
> The report of the damages was made to Kenneth B. S. Robertson, Ltd., at Montreal, Canada, on Monday, August 19 via airmail, special delivery.
>
> Before noon the next day (Tuesday) their insurance adjuster in St. Louis called me to investigate and adjust the claim, which was done that same afternoon.
>
> This service is almost unbelievable but, nevertheless, it was done.
>
> I certainly wish to recommend this type of service to any plane owner.
>
> C. B. Martin, Jr., 23975
>
> St. Louis, Mo.

FCC REVISES AIRCRAFT RADIO LICENSES

Red tape governing non-scheduled aircraft radio has been slashed by the Federal Communications Commission in its latest rulings which set up simple and efficient forms in place of the complicated system of aircraft station and operator's licenses.

Prompted by an AOPA campaign, the FCC devised the new non-scheduled aircraft radio station application form (FCC Form 404-A) and new aircraft radio station license, made in part from FCC Form 404-A. A similar revision of the operator's license is being prepared at the present time.

The association voiced strong criticism of the wartime forms and AOPA General Manager J. B. Hartranft pointed out better and more useful methods of making up the forms for private flyers.

The new aircraft transmitter station application is simple. Answer the questions on the front and back of the 5x8-inch card and send it in to the FCC, Washington. Application cards will be obtainable from the FCC or its field offices. If approved, CAA flight examiners also will have them.

Flight examiners may assist in the operator's license scheme should present plans be accepted. It is proposed that the examiner be deputized to receive and forward the operator's application and immediately to deliver a temporary license good for 90 days. The permit would be good for five years.

In explaining the new forms to AOPA representatives, the FCC said that the aircraft station license is good for the term shown on its face or until the aircraft is sold or transferred.

However, the buyer may treat the license as a special temporary radio station authority for a period of 30 days, providing an application for transfer or an application for new license has been mailed to the commission. The association warns members to make certain that the purchaser has mailed the application for new license. If not, remove the license.

John H. Hoffman, AOPA lawyer-pilot, is defending private flyers who are protesting the closing of Malvern, Pa. airport.

Only one loophole in the new license usage was spotted. In the case of an owner flying a plane from the factory it is likely that the radio transmitter would not be covered by a license. It could then be used only in an emergency.

To cover this, Hartranft suggested that the manufacturer be permitted to approve a temporary 10-day license for the airplane buyer.

A "portable-mobile" license is now under FCC consideration. It would allow manufacturers to "loan" the license so that the buyer may use the radio when flying a new aircraft from the factory to the buyer's home.

The proposed license would be under the control of the manufacturer and be returned to him on completion of the flight from the factory.

SAFETY HARNESS NECESSARY

"Built-in safety," one of the more neglected factors in personal aircraft design, has gained strong acceptance among research experts and experienced pilots but continues to get scant attention from most aircraft manufacturers.

A shoulder harness is one of the finest and certainly one of the cheapest safety devices, in the opinion of aviation researchers. A report from Crash Injury Research, sponsored in part by your association, states:

"Better than 20 per cent of the fatalities in personal flying could have been avoided by stronger safety belts and the use of self-locking (inertia) harness." Other authorities point to the same conclusion and even raise this conservative estimate.

The association knows that many of its pilots and owners are aware of the problem and have observed the need for safety designing in personal aircraft. If you would like to state your opinion or relate an incident, please write us your views.

Pilots must demand engineered safety, such as shoulder harness, before manufacturers include this vital factor. Let the manufacturer know that you, as a pilot or aircraft owner, want a plane safe to fly and in which is incorporated the maximum safety in event of an accident.

HOFFMAN OF MALVERN

A flying lawyer, John H. Hoffman of Kennett Square, Penn., believes in the future of non-commercial aviation. A member of AOPA (No. 21498), he is defending a group of private flyers at Malvern, Pa., in a case expected to be one of the milestones in personal aviation. Malvern Airport is fighting a suit demanding it be closed as a nuisance—just as if it were a garbage dump.

Hoffman soloed in 1936 in a Piper Cub. Believing in the utility as well as sport of personal flying, he has continued to add hours to his log books. In his defense of the Malvern Airport he has been given full support by the association, which he credits with implementing his entire defense structure.

Last month's AOPA Pilot—confidential publication sent to AOPA members—did not give Hoffman's name in the list of AOPA lawyer-pilots. To further aid pilots "in distress" he recently opened a new office at West Chester, Pa., in the Farmers and Mechanics Building. END

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Boosts Quality Protection!

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Aviation Compass
Illuminated

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Holding a heading with a Sherrill is easy . . . even in the roughest, toughest kind of air. These Aviation Compasses are directly developed from the famed Sherrill Compasses used in combat vehicles where accuracies to within plus or minus 2° had to be maintained.

The large, legibly marked compass card is mounted on a permalloy-tipped pivot with a glass jewel, assuring highest sensitivity. Compass always remains steady, free from sway, and won't jam with normal rolls and pitches of the plane . . . ample clearance space permits the card to tilt up to 28° . . . All compasses are vibration, altitude, and temperature tested. Exclusive built-in compensators permit finger-tip compensation even in the air.

- **Plastic Housing**
- **Micro-Adjustment Finger-Tip Compensators**
- **Glareless Illumination**
- **Adjustable Heading Indicator**
- **Built-in Correction Card**

MODEL 1368 AVIATION COMPASS WITH HEELING CORRECTOR

Similar to, and slightly larger than, Model 430 above. Has Quadrantal, Semi-circular and vertical or Heeling correction for precise, accurate compensation. Requires no correction card and assures steady, reliable performance at all times.

$47.50

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Stop Selling Aviation to Ourselves!

(Continued from page 18)

sentatives of lightplane interests and lightplane owners, aided by CAA sound and safety experts, promptly went to work. It was found that truck traffic as far as 230 feet away produced peak noise levels of 80 to 90 decibels, while aircraft noise from aircraft directly overhead was only 70 to 85 decibels, depending on the size of the airplane. While aircraft noises remained at the peak for only from three to five seconds, other disturbing noises were "generally of longer duration," CAA sound experts reported. In sum, scientific measurements of sound showed comparable noise levels between planes in flight and various ground transportation vehicles.

Similar teamwork defenses have been successful in establishing community airports in recent months in Ohio and Illinois.

From the defensive, we have moved to the attack. Successful community fields—notably the one created with the assistance of the Aircraft Industries Association at Eldon, Mo.—have been put up and are succeeding. The moral at Eldon is one that any layman can read, a community has made the airplane a vehicle toward better modern living, and everybody in town is having a lot of fun using it.

Eldon's—and similar ideas—are being applied elsewhere. The Government players on the team, personal flying specialists and airport experts in the field, are selling flying. They are selling it, to be sure, to flying enthusiasts, but—more important—they are selling it to Chambers of Commerce, Rotary Clubs, even Ladies Aid Societies, those groundlings of influence whose opinions can make a community airport a success or an uninteresting clearing in the wilderness miles from town.

The work of the AIA at Eldon also is but one indication of how industry is taking the lead in playing stellar ball on the team.

I add with confidence that the airport program is going to succeed despite our belated salesmanship. I am convinced that the key to its success is the teamwork that has been outstanding on the part of all concerned.

This must continue. The good-neighbor policy for the airplane must be pushed on all fronts.

The demands of the mass market, however, should result in more Government-industry teamwork. There are already straws in the wind. A few weeks ago, lightplane engineers and aeronautical experts at the National Advisory Committee on Aeronautics held a conference to match notes on what NACA had done during and since the war that was of value to the lightplane. Technical improvements which may result are not yet evident, but even if nothing else was accomplished the conference was significant because it sounded the keynote—teamwork—for lightplane research by

Flying Radiofone

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Naturally, North American's NAvion is equipped with the General Electric Flying Radiofone—assurance to you of the finest radio communication performance and broadcast reception for personal planes that your money can buy. With this radio you can talk to control towers and radio range stations—consistently. And you will hear more broadcast stations than you ever heard before—both for pleasure and for homing.

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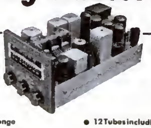

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Government and industry. The more research we have, the faster we will progress.

For to become really useful—a machine that will gain the acceptance now enjoyed by the automobile, the railroad, and the motor boat—the airplane must become almost as easy to operate as its rival machines.

This calls for the most intensive research and development program in the history of civilian aviation. Such a program is overdue. All of us waited patiently for it during the war. Many of us participated in the research and development of military planes. But the time has come to give research emphasis back to civilian products.

I say this with all due regard for the military problems now facing us. I realize that they are great and that behind them is the need for preparedness. But it should be realized, also, that our chief asset in this last war at the outset was not a large air force (we ranked seventh when the shooting began). It was not military training or research. It was, rather, a population which had, for peacetime pursuits, manufactured, maintained and operated more machine vehicles than any other country in the world. Free civilian enterprise is the spark plug of our accomplishments, and in aviation more than any other field it must be promoted to the hilt.

To maintain our world leadership and to give our citizens airplanes for any need, we must strive toward making our lightplanes safe, roadable, and capable of flying in all but extremely bad weather conditions.

Federal funds could be used to advantage to subsidize private enterprise toward developing the ultimate in inexpensive, fool-proof planes, instruments, and engines. We have only scratched the surface in each of these fields. With our magnificent production know-how—and with teamwork—we should ultimately have useful planes comparable in cost to the automobile.

I realize this is a large order. It is a *must* if we are going to achieve the goal we have set for ourselves.

Perhaps one reason for delay has been the complicated task of both Government and industry in getting back to peacetime functions. Certainly it has been one of the major problems at CAA. Which brings me to another much-debated subject: regulations.

The Administration was acutely aware that industry was over-regulated at war's end. The Army and Navy had to keep an eye on everything and everyone during hostilities, down to the last mechanic apprentice on a civilian field. The CAA did everything possible in its power to help.

With peace, CAA and CAB cut away all the obvious wartime regulations. We streamlined the rest. During the first peacetime year, ended last August, the volume of onerous regulations was greatly reduced—with the accent on lifting all but the bare essentials governing private flying.

I think my associates in the Administration have, when the over-all accomplishment is inspected, done magnificently. But they and I are agreed that the year to come should see continued streamlining to reduce regulations to a minimum.

I believe that the Civil Aeronautics Administration should reduce regulations as much as possible, but I do not think that this can be done without full-throttle co-operation from the industry. With that co-operation, I am equally convinced that we can, among others, do the following things:

1. Reduce certification of new aircraft to a point where it can be handled by a handful of CAA personnel. This calls for licensing manufacturers and holding them responsible for the safety of their equipment.

2. Put the emphasis in lightplane enforcement on education rather than discipline. In other words, let the flying public—properly coached and observed by CAA spot-checks—be its own most militant enforcement agency. That is where the emphasis must be.

I realize that none of these things can be accomplished overnight, or even in a year. But a goal is not worth the try if it isn't difficult to attain. And I sincerely believe that these goals can at least be approximated—by teamwork. END

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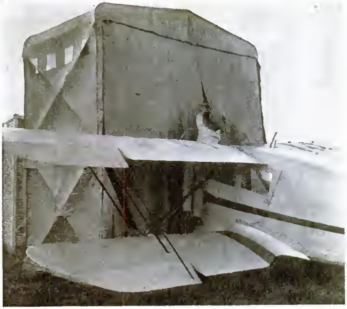

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How to Fly in Mountains

(Continued from page 44)

and only cross high passes where necessary.

2. Are there any areas of consistent updrafts or downdrafts or other weather peculiarities in the cruising vicinity of your airport?

Westerly winds prevail in Colorado at elevations above 10,000 feet. As a general rule, therefore, updrafts may be expected on the west side of all ranges and passes running in a north-south direction. Downdrafts may be expected on the east side of such ranges and passes. East-to-west crossings, therefore, require more time and skill than west-to-east flights. Of course, when the wind is from the east, up- and downdraft conditions are reversed. Remember: Air will flow against a mountain range, up its side, over the top and down the other side.

Light to moderate turbulence may be expected in mountain areas in the afternoon, especially in summer. Best time for trans-mountain flights is during the morning hours.

3. What suggestions would you make to the average pilot with respect to best mountain-flying procedures?

Some dual instruction with an experienced mountain pilot is recommended for the novice. Do not fly up or down in mountain canyons but along the ridges or mesas on the sides where updrafts are to be found. Cross high ridges or passes at a 45° angle to permit an immediate turn to lower ground in case of emergency. If a downdraft is encountered while approaching a steep ridge head-on, the plane may be carried into the trees before the pilot can turn away. If caught in such a downdraft, make an immediate though gentle turn for the area of the lowest ground and maintain flying speed.

Use pilotage procedures, sectional charts and all possible check points. The longest way around is often the safest way home in the mountains.

Be alert for changes in wind direction and velocity. Wind above canyons is often different in direction than it is down in the same canyons. Know where the low ground is; know in which direction to turn at a moment's notice if caught in a downdraft or in turbulence.

Always have an auxiliary field picked out. With the exception of deep, narrow canyons, there are often open areas in timbered regions and wide meadows in mountain valleys where an emergency landing can be made.

If turbulent air is encountered, reduce r.p.m., use carbureter heat, reduce air speed somewhat below normal cruising and (most important) keep the nose down. Do not place the aircraft in a climbing position where it might stall.

Keep in mind that the actual horizon is near the base of a mountain. The mistake of using the summits of peaks as the horizon is often made. That puts the aircraft in a constant climb, with the resultant danger of an unexpected stall.

Do not overload a lightplane. Carry only minimum baggage and extra equipment. Remember that your plane will have to climb to 12,000 feet or more when crossing some passes and ranges.

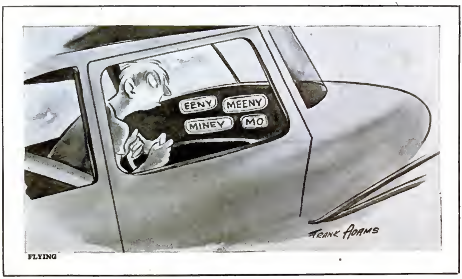
An airplane must be in absolute airworthy condition for mountain flying. All instruments should be functioning normally; all controls—including carbureter heater, cabin heater and mixture control—must be in order. Do not fly with a malfunctioning engine. High altitude reduces the horsepower of an engine unless it is supercharged.

Telephone for weather information at your destination when there is any doubt. Do not fly into storm areas, either winter or summer. It is often possible to circumvent local mountain storms. Ask local airport operators for their recommendations concerning routes, weather conditions and flying procedures.

Trust your altimeter. Trust your compass. In the event areas of local magnetic attraction are marked on your chart, be governed accordingly. Seek out updrafts on the west side of mountains and ranges as an aid in gaining altitude. This will save engine wear and conserve fuel.

4. What do you recommend for take-off and landing techniques in lightplanes at your airport elevation, as compared with that at Denver, or at lower ones?

At Denver, elevation 5,300 feet, twice as long a take-off run is required as at sea-level. The higher the airport elevation,



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CESSNA AIRCRAFT COMPANY, DEPT. F, WICHITA, KANSAS the longer the take-off run required.

When flying at elevations over 10,000 feet, the rate of climb is reduced, although the angle of attack may be the same as at sea-level. Horsepower of the engine also is reduced. Aircraft will stall more easily and at a higher ground speed. They likewise will glide at a steeper angle although with the same attitude.

The following take-off techniques are recommended for mountain airports at elevations above 5,300 feet:

Take off in level flight position; do not attempt three-point take-offs. Climb at a shallow angle, maintaining a safe margin above stalling speed until a safe altitude is reached. Make no turn after take-off at less than 300 feet.

The following procedure is recommended for landing on mountain airports above 5,300 feet:

Glide with the nose well down to maintain a safe margin above stalling speed. Hold the glide attitude until the aircraft is very close to the ground and then break the glide and prepare for a normal landing. If approaching a mountain field for the first time, use a power approach to maintain adequate control. With such planes as the Cabin Waco and the Fairchild "24," wheel landings with power on are best for mountain airports. If the surface wind is 15 m.p.h. or above, it is also recommended that such types as the Aeronca and Luscombe be landed with power. Use power approaches for cross-wind landings, in high wind or rough air.

Some mountain airports are located on mesas. Updrafts and downdrafts occasionally may be experienced on approaching the edges of such mesas. Power landings should be made on mesas.

5. What suggestions do you offer the average pilot on navigation procedures in mountain areas?

Use pilotage methods and sectional charts. Plot the route prior to take-off and study it carefully, noting all check points, pass elevations and auxiliary airports. Dead reckoning calculations are of little value to the lightplane pilot while flying over the mountains.

Trust your instruments, but note areas of local magnetic attraction and watch the curved lines of magnetic variation marked on the charts.

6. Is there any special equipment which you would recommend while flying mountainous country, especially in winter?

Dress warmly for winter flying. Make sure the cabin heater is functioning. Travel as light as possible, with a minimum of excess baggage and equipment. A lightweight tie-down kit is recommended. Skis and snow shoes are not recommended. Adequate sectional charts should be carried. A cardboard burp cup is an invaluable piece of equipment when needed.

7. In the event that existing agencies in Colorado can be combined in a mountain area weather reporting system, what agencies do you think would be of value?

U. S. Forest Service fire lookout stations and the U. S. Grazing Service shortwave radio network would be invaluable. Such state organizations as the highway courtesy patrol and the highway department, reporting from their various bases could be used. Many pilots recommend that large orange-colored wind-socks be placed atop much-traveled passes such as Corona, La Veta, Cumbres, Hayden and Wolf Creek.

8. What mountain areas and passes do you consider unsafe for light aircraft?

The following passes are unsafe: Independence, Tennessee, Loveland, Fremont, Red Mountain, Monarch, Cameron and Fall River.

The following general areas are unsafe for light aircraft: The Hell Hole region southwest of Idaho Springs; the San Juan Mountain area; the Collegiate Range from Mount Shavano south to Leadville; the La Garita Mountains; the area comprising the Sawatch and Elk Head Mountains and the Gore Range.

As a general rule, do not enter mountain passes where you cannot land your plane safely in case of emergency. In other words, common sense and good judgment are the requisites for safe mountain flying. The 180° turn is the safest maneuver at the pilot's disposal.

Successful mountain flying requires an aircraft in first-class condition and forethought and planning on the part of the pilot. Turbulence over the ranges rarely gets as violent as the thunderstorms over western Kansas in mid-summer. END.

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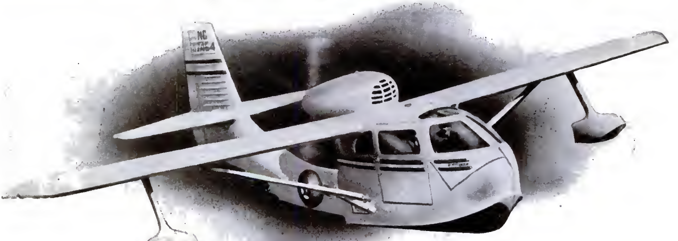

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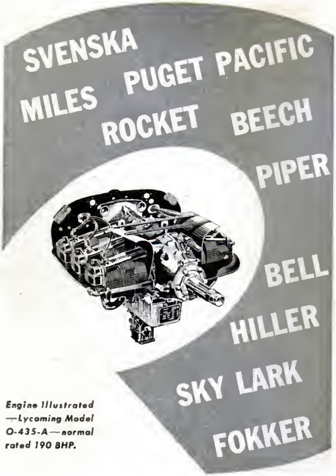

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Airline to the Moon?

(Continued from page 29)

The storage and temperature requirements were tough hurdles. One propellant after another proved satisfactory on one score but inefficient on the other. For instance, ballistite (composed essentially of nitrocellulose and nitroglycerine) had good energy content but was too sensitive to temperature changes. A rocket loaded with ballistite and designed to deliver 1,000 pounds thrust at 90° could deliver only 600 pounds at 40°.

The research men turned to an entirely different type of propellant, made by casting the ingredients in a mold rather than by compressing them. The laboratory called its product GALCIT 53. It was a special type asphalt, mixed with a small percentage of oil. First tested in June, 1942, GALCIT 53 proved to withstand a wider range of temperatures than the powder propellants. It was recommended for firing between 40° and 110°. The stuff detonated with difficulty, but once ignited, burned fiercely with a white light and dense smoke.

Large orders for motors with thrust of 500 and 1,000 pounds were placed by the Navy in 1943. Development work on these larger units was carried on both by GALCIT, and the Aerojet Engineering Corporation of Pasadena. The laboratory produced GALCIT 61-C, an improved solid propellant, in 1943, which the Navy continued to use until the end of the war.

While solid-propellant JATO rockets were being developed, simultaneous investigations were carried on in the field of liquid propellants. The first question was choice of an oxidizer, the element essential for burning. Oxygen was the most obvious, but in its gaseous form, tanks to contain it are prohibitively heavy. In liquid form it is difficult to ship or store.

The group decided to try red-fuming nitric acid, a solution of nitric acid and nitrogen dioxide. Although corrosive and dangerous to handle, the group believed metals could be found to resist the acid. The question was whether it would burn completely with a fuel. Tests completed in December, 1939, proved that it burned well with gasoline and benzine. By July, 1940, more trials indicated the way was clear for construction of a liquid rocket to develop the 1,000 pounds thrust for one minute that was an important goal of the Army.

A great many disheartening failures followed in trials in a test pit lined with railroad ties, a stockade-like affair to protect watchers from explosions. Ignition was the principal trouble. Unless it was instantaneous, so much fuel accumulated in the combustion chamber that, when it did ignite, the motor blew up. Finally, in May, 1941, a successful 200-pound thrust unit was developed. Then the experimenters progressed to a test with a 500-pound rocket that worked after but one explosion, and they went on to the 1,000-pound machine.

Trouble overtook the experiments with the big motor in October, 1941. Although fitted with two spark plugs and with a manifold drilled for 45 intakes, ignition was delayed or failed. Worse, the motor developed a pulsing tendency and, unless shut off, it would blow up on the fourth or fifth throb.

During this period, one of the scientists visited the Naval experimental station at Annapolis, where another group of investigators was experiencing difficulty with combustion of nitric acid and gasoline. One of the Navy men suggested that addition of aniline to the gasoline might help. The GALCIT group dispensed with gasoline altogether, substituting aniline. The aniline and acid mixture proved to be spontaneously combustible, ending all problems of ignition, throbbing and combustion. Although toxic and difficult to handle, it was decided to adopt aniline and bear the burden of training crews to manage it.

Forty-four successive tests were made in April, 1943, with a 1,000-pound rocket motor fitted to a Douglas A-20 bomber. They went off without a single mishap or explosion. Thereafter, Aerojet Engineering Corporation took over further development of a type for operational use. Both Aerojet and the laboratory have since produced larger as well as different types, doing research both independently and in co-operation.

GALCIT'S next assignment was to experiment with jet propulsion of underwater missiles to be launched from bombing planes. A towing channel 500 feet long, 16 feet deep, and 12 feet wide was built for study of the underwater performance of the aerial rocket-torpedoes. Over the channel ran an electric tow-carriage, capable of traveling 40 m.p.h. On one side

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at the center is an underground observation station, with a glass panel.

The principal concern of the laboratory was cavitation, the phenomenon occurring when water pressure is reduced at certain points on the surface of a streamlined body as it reaches critical speeds through the water. When the pressure drop becomes great enough, the water vaporizes and forms bubbles. They cling to the body, greatly increasing drag.

The motor used in the tests thus far burns a solid propellant delivering a thrust of 2,200 pounds for 30 seconds. Called GALCIT 65, it is a compound including potassium nitrate to control burning rate, which had to be slowed to one inch a second to produce a burning duration of 30 seconds. Although it was feared the terrific impact of the torpedoes as they hit the water might wreck the rocket motor, tests at the Navy's torpedo-launching range at Morris Dam, Calif., proved GALCIT 65 capable of withstanding launching velocities up to 385 m.p.h.

In January, 1944—just five months before the Germans began pelting London with the vicious V-1 and V-2 missiles—the Army ordnance department asked the laboratory to undertake development of long-range, jet-propelled missiles, the first project of its kind in the United States. The first experimental missile, about eight feet long and with a sharply pointed nose, was called the "Private A." It weighed over 500 pounds, was driven by an Aerojet E rocket unit with a thrust of 1,000 pounds for over 30 seconds. The booster unit to initiate quick take-off delivered thrust of 21,500 pounds. Tested in December, 1944, Private A averaged a range of 18,000 yards in the firing of 24 rounds.

Experimenting with control surfaces, the laboratory produced the Private F in the spring of 1945, with two stubby wings forward and a fin and two horizontal lifting surfaces at the tail. The tests demonstrated the need of flight control equipment for missiles with lifting surfaces.

Most spectacular of the laboratory's weapons so far is the "WAC Corporal," first tested in the autumn of 1945. It was designed, on an ordnance department order, to carry 25 pounds of meteorological equipment to an altitude of at least 100,000 feet (about 19 miles). The Corporal weighed 665 pounds, measured 16 feet from needle-pointed nose to tail, was 12 inches in diameter, and delivered thrust of 1,500 pounds for 45 seconds. The take-off booster delivered 50,000 pounds for a little more than half a second. A launching tower 102 feet high was built to fire the rocket. Tracked by radar, the Corporal attained a height of 43.5 miles.

The laboratory now is at work on a system for remote control of guided missiles, and upon two systems for transmitting data from missiles in flight to ground stations. The Sperry Gyroscope Company has designed an automatic pilot using three gyroscopes to control angle of flight, veering off course, and roll. Small motors operated by compressed air move rudders on the stabilizing fins to guide the rocket.

For study of flight characteristics of model airfoils, the laboratory designed a rocket known by the code name "Raft."

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An airfoil under study is mounted on a beam protruding from the rocket's nose, and forces acting on it are recorded by strain gauges.

In a special station at the AAF flight test base at Muroc Dry Lake, the laboratory is working on a motor designed to produce thrust of 20,000 pounds for duration longer than one minute. A motor of that size consumes propellant at the rate of three tons a minute. The researchers are now collecting data on the characteristics of motors using hydrogen peroxide and liquid oxygen. One of the goals is to develop a satisfactory means for supplying the high pressure under which fuel must be forced into rocket combustion chambers. Gas pressure is not good because its weight and bulk in quantities required for rockets of long duration is prohibitive. The Germans in the V-2 substituted centrifugal pumps for gas pressure, driving the pumps with a turbine, which in turn was driven by exhaust gases generated in a special chamber.

For a year the laboratory has studied the possibility of supplying pressure with gases from chemicals installed in the missile, a method promising to be lighter than any that has been thought of up to the present time.

High on the lab's priority list for experiment are materials capable of withstanding the enormous heat of rocket motor combustion. Nothing has yet been found that will take the hottest flame of some propellants. Chamber temperatures of rocket motors using aniline and nitric acid range from 3,500 to 5,000°. Reaction of gasoline and liquid oxygen may give temperatures as high as 6,000°. Yet, other things being equal, the higher the heat of combustion, the higher the exhaust velocity—and the higher the exhaust velocity, the lower the rate of propellant consumed. If improvement is to be made in rocket performance, the laboratory men say, new materials must be discovered, or known ones must be improved. Many heat resistant metal alloys, as well as ceramic materials, are under intense study. END

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RECEPTION over Zwickau, Germany, had been a bit warm for the Flying Fortress*—flak had knocked out two engines. Losing altitude all the way, the pilot might have made England but another burst from a gun emplacement in Belgium knocked out the third engine.*

The crew bailed out and the pilot brought the plane down along the coast where a boat promptly picked him up and hustled him back to England.

At the base, the engineering officer who took over asked, "Did the airplane fly all right?"

"She flew like a dream," was the poker-faced answer. "When we ran out of engines, we cranked the flaps up and down—got about 20 miles more out of her. Trouble was we just couldn't crank those flaps fast enough."

—R. E. Williams

THE kid had about 200 hours flying and was taking the cadet instrument course, sweating over the dials and gauges. The instructor—after almost an hour of explaining the needle and ball, altimeter, air speed—gave up. He told the cadet to head back to the field in a slow glide making turns to the right and left.

At first the glide was okay, but with each turn the airspeed jumped and the nose dropped until the plane was diving. The instructor looked at the altimeter . . . 5,000, 3,000, 1,000—500. Just about then he figured things had gone far enough. He reached over, tapped the cadet on the shoulder and said dryly:

"At the sound of a dull thud, the altimeter should read zero."

—Rus Walton

IT WAS 11 a.m. and the Flying Fortress *had been missing from a U. S. training field since seven the previous evening. The telegrams were all ready to be sent to the next of kin informing them of the tragedy when the phone rang in the colonel's office.*

"Colonel," came a pathetic voice, "we got lost . . . I think we flew the Atlantic . . . Nobody here speaks English."

The colonel barked an order and the call was traced. The missing Fortress *had landed 25 miles northwest of Montreal!*

—Mervin Roland

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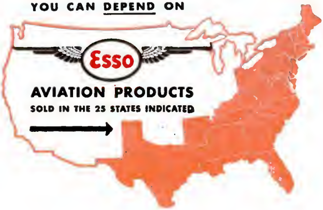

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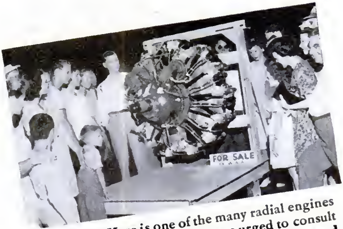

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Time and the Airman

(Continued from page 31)

seconds a day, the flyer can make a quick and easy correction at any time during that period. He need only subtract two seconds for each hour the watch has run since it was set. If, for instance, the watch was set at 0400 hours and now reads 1900 hours, the watch has been running for 15 hours, has gained 30 seconds and the time can be corrected to 1859½. So long as the watch gains 48 seconds a day, every day, its "rate" is constant.

Hack watches are accurate, practical and convenient, but for celestial navigation and very often for other uses, a more accurate source of time is required. If it is possible to carry in a plane a larger, but more accurate timepiece, the hack watch may be used as a "comparing watch." This means that every few hours during the flight, the navigator can re-set his wrist watch to agree precisely with the master time source. Most common master time source is the "navigation master watch." It is a large pocket watch of the finest construction, with 22 jewels and a five-beat movement (23 jewels is the largest number in any watch). The sweep-second hand can be stopped for speedy synchronization with a master time signal.

Navigation master watches invariably have 24-hour dials in order to "carry" Greenwich Civil Time, which is most commonly expressed in the 24-hour system (1:00 a.m. is expressed as 0100 hours, 4:00 p.m. as 1600 hours and so forth). Master watches are regulated more carefully than the smaller hack watches, and very often have a daily error of less than 10 seconds, while the rate varies as little as one second daily.

The next most important category of aviation timing devices consists of interval timers such as stop watches, chronographs and elapsed-time clocks. Probably half of all the time measurements in aviation require timing within seconds. For these purposes a stop watch has a number of advantages. Most important is that the complete record is kept on the face of the watch itself and not in the mind of the flyer. To measure ground speed by timing with a hack watch, for instance, the airman would have to (1) look at the first landmark, (2) glance at the watch, (3) make a mental note of the time, (4) look at the second landmark, (5) again glance at his watch, (6) make another mental note of the time, (7) subtract the first time from the second and thereby determine the elapsed time between the two points. Using a stop watch eliminates a good deal of this. Coming over the first landmark the flyer pushes a button which starts his watch. Over the second landmark he again pushes the button and reads directly the elapsed time. The advantage in accuracy is evident; ground speed by timing often involves measurements accurate to 1/10 second.

For the private flyer who does not necessarily need the extreme accuracy provided by a set of three timepieces such as the hack watch, master watch and stop watch, some of the advantages of all three are found in one convenient device called a wrist chronograph. This is a conventional watch with an added stop watch action. A chronograph is a large wrist watch with one or two push buttons on the case near the winding knob. It has the usual hour-and-minute dial, a small dial with a conventional second hand, another small dial called the "elapsed time register," and a large sweep-second hand much like the central hand of a stop watch. In chronographs with one push button, the action is the same as a conventional stop watch: the one button starts, stops and re-sets the sweep-second hand. In chronographs with two push buttons, the watch has a "time-out" feature. One button starts, stops and re-starts the sweep-second hand. The other button is for re-setting. This feature is useful in keeping a record of the total flying time only, with time out for landings and take-offs for example.

Wrist chronographs can have two additional features. One is a "telemeter" scale, used mostly by artillery officers. The watch is started when the flash of a gun is seen and stopped when the sound reaches the observer's ear. The distance of the gun can then be determined by reading the second-hand against the telemeter scale, which is in miles. (Sound usually travels a mile in about five seconds.) The telemeter scale can be used to measure the distance of lightning by starting the watch on sight of the flash and stopping it on hearing the thunder.

The second special scale is the "tachymeter," which directly converts time-over-a-measured-mile into speed. The watch is started on passing the first marker and stopped on passing the second. The second hand then indicates m.p.h. on the tachymeter scale.

Chronographs are delicate, the natural result of having such a complicated mechanism in a small case. While no watch should be subjected to abuse, wrist chronographs are more susceptible to damage in ordinary use than are the larger, precision timepieces. Chronographs also are difficult to regulate and adjust. But they are extremely compact, versatile and are not very expensive.

For airmen wanting the convenience of the chronograph and the stalwart construction of a larger timepiece, there is the pocket chronograph. This is a larger watch of about 20 jewels, with stop watch actions graduated in 1/5-second intervals and with an elapsed time register totaling up to 30 minutes. In accuracy it falls between a good hack watch and a good master navigation watch.

Next major category of specialized aviation timekeepers includes instrument-panel clocks. There is little mechanical difference between an airplane clock and an aviation watch. The size of the mechanism is larger, of course, and the adjustments are not so fine. But the gear train, the type of main spring and the escapement are essentially the same. Because there is more room in a clock case, it is possible to use a larger "barrel" and longer mainspring, the latter determining the length of time the clock will run without winding. The Army Air Forces' A-11 will run eight days on one winding. Because of the vibration to which air-

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plane clocks are subjected they must be sturdy. But they are not as accurate as hack watches and are not ordinarily used for precision navigation.

Some airplane clocks are more complex than others. The A-11, for instance, has a conventional 12-hour face. Another type has a 24-hour dial, sweep-second hand and a civil date indicator. This is called an airplane calendar clock. Those built for the U. S. Government have 15 jewels and an eight-day movement.

Most elaborate of all aviation timepieces is the elapsed-time clock. This remarkable timekeeper has these features:

The main dial indicates hours and minutes on a 24-hour scale. A small dial has seconds indicated by a conventional second hand. The sweep-second hand is part of a chronograph mechanism, accurate to a 1/5 second. Another small dial registers up to 60 minutes of the chronograph action. A start, stop and re-set button controls the chronograph. Still another small dial shows total elapsed time in hours and minutes on a 12-hour dial and is controlled by a start, stop and re-set button. Finally, the fourth small dial records the civil date in the same manner as the airplane calendar clock. Elapsed-time clocks have over 400 parts. It took over 100,000 manhours of engineering and tool building by one manufacturer to prepare to mass-produce them for the Army and Navy.

The world's most accurate clocks are the precision regulators used by astronomical observatories. There are not more than 2,000 such regulators in the entire world. Next in precision is the chronometer, a timer carried by all large steamships and generally kept at large airports as the master time source. They are rarely carried in aircraft because of their size; the navigation master watches are accurate enough for most aviation uses. But the chronometer is important because it is a main source for precision checks on other aviation timepieces.

The chronometer is mounted in a set of gimbals so that it will always be in a horizontal position. It has a type of mainspring called a "fuzee," and its special escapement is very delicate. In addition to the hour, minute and second hands, most chronometers have a winding indicator to show how many minutes the instrument has been running since it was last wound.

Airport clocks and chronometers usually are synchronized with master time signals broadcast by the Navy 12 times a day. These signals are broadcast on four frequencies (122, 4,390, 9,425 and 12,630 kc.) for every even hour (at 0200, 0400, etc.). A series of short Morse "dits" are broadcast for five minutes before the hour. On the hour, a long 1.3-second dash is broadcast, giving the exact time.

Whether you are a private pilot or a navigator of an ocean-spanning airliner, you must know the right time. Choose your timepiece carefully—it is one of your most important instruments. END

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TRANSPARENT coatings of a new electrically conductive substance on airplane windshields may solve cockpit visibility problems caused by icing and fogging.

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Research Engineer William Lytle (above) of the Pittsburgh Plate Glass Co., where the product was developed, claims the coating does not distort visibility and is little affected by wear from windshield wiper blades or weather.

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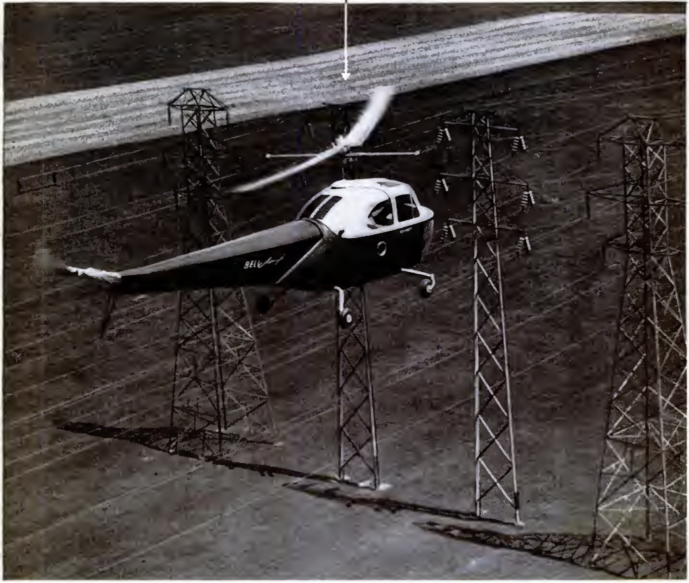

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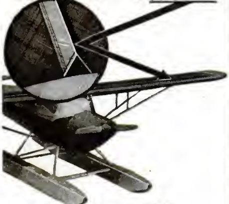
BOGARDUS Nylon COVERS with the built-in SPOILER*



The Bogardus Wing Cover-SPOILER* causes lift loss to give you the extra protection you need in high winds.

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BOGARDUS COVERS with the Built-in Wing Spoiler provide ideal protection for your tied-down plane and are light enough to be carried for protection enroute. Fully equipped with all webs, cords, zippers and snaps, they can be slipped on easily and quickly by one person.

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* Patent applied for

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Engine Cover	12.75
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20 MECHANIC STREET • NEW ROCHELLE, N.Y.

I Learned About . . .

(Continued from page 52)

cator, I had no idea how fast I was actually going—but even as I pulled further back on the stick I knew that I was gaining speed because the wires were beginning to scream. There seemed nothing I could do about it.

I knew by now that there was something wrong but I didn't know what it was. The solid white blanket of fog about me was doing a splendid job of hiding the plane's attitude and I noticed that the seat of my pants wasn't giving me any indication of anything out of the ordinary happening to the plane.

I looked up at the compass that I had placed so much faith in to see me through my experiment and the card was lying on its side. This had me stumped. By now I had the stick all the way back and I pulled it hard over to the right to try to straighten up the compass card but it did no good. All this happened in a very short time and I'll admit that I was beginning to sweat.

I looked at the altimeter and it read 500 feet and was going down fast. I thought at last I'd get out in the clear and find out what was going on. The plane raced down below the 500-foot mark and there still was no clearing.

I was really getting worried now; it seemed that everything had let me down when I needed help the most. The compass lying on its side, the tachometer running wild and the altimeter showing less than 500 feet with still no clearing. Then suddenly I broke through the fog and there was the ground straight ahead and spinning wildly.

I realized immediately that I was in a tight spin and I quickly pulled the throttle back, shoved the stick full forward, and kicked hard right rudder to stop the spin at once. There wasn't a second to spare at that low altitude as I was coming down directly on top of the General Engineering factory building, directly across the street from the airdrome.

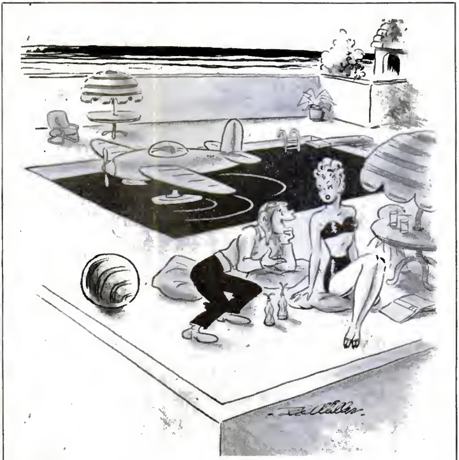
The plane responded quickly to the controls and the spinning stopped. I pulled the stick full back to keep from hitting the factory.

I thought for a moment that the wings would pull off in the sudden pull-out but the plane shivered, took the severe strain and I missed the end of the building by about 20 feet. I was lined up with the runway on the airdrome and in position to land.

The terrific speed that the plane had attained in the dive was hard to dispel and I floated nearly to the far end of the runway before losing enough to set down.

I sat in the cockpit and listened to the idling engine ticking over for several minutes before I was ready to taxi back to the hangar.

My log book shows that the flight lasted just 30 minutes, but in my estimation it gave me years of experience. END



FLYING

". . . So, naturally I had to land somewhere."

Sometimes you can break a good rule!

It's usually a wise rule not to plan a chicken dinner before the eggs are hatched.

But not always!

If the "chicken dinner" represents your future, and the "eggs" are financial nest eggs—go ahead and plan!

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Airplanes—Special Delivery

(Continued from page 35)

eran AAF pilot—traces the founding of American Fly-Away, which should make him the prime idea man of personal-plane ferrying.

Organizational work didn't begin until mid-1942, after Waggener had abandoned his law practice in Memphis to take up Army flight training. Also, he met Leon W. Wilder of Indianapolis, a veteran of 15 years in aviation.

Waggener was at the Lodwick School of Aeronautics at Lakeland, Fla., in January, 1942, where Wilder was his primary instructor. From that companionship came the partnership which today is American Fly-Away. Wilder taught Waggener how to fly; Waggener sold his instructor on the possibilities of a plane-ferrying service.

This isn't an unusual way for a ferrying firm to be launched. Take the case of the National Aircraft Ferrying Company, also of Dayton. Comprised entirely of veterans, NAFC came into being in September, 1945, when Maj. Robert S. Johnson, the second ranking ace of the ETO, stood up to speak to a group of pilots in the tarpaper ready-room of Unit D, Abilene, Tex., Army Air Field. His hearers, all *Thunderbolt* pilot trainees, fell for the idea of a specialized ferrying company, and NAFC was born. Johnson now is inactive, but the old gang still carries on.

Meantime, war's end had turned on the green light for Wilder and Waggener. By this time Waggener had acquired captain's bars and 300 combat hours in the Southwest Pacific.

Here is how the system works:

Suppose you're a citizen of Bowie, Tex., with a war-heavy bankroll and a yen for an Aeronca *Chief*. You buy one—but, airplanes are sold fly-away factory. Somehow that plane must be picked up at Middletown, O., and brought to your home city. Quite possibly your distributor is one who has a contract with one of the ferrying firms, say American Fly-Away. He tells you your plane will be delivered by American Fly-Away in a few days.

Aeronca notifies the ferry company that the airplane is ready for delivery. Wilder and Waggener check the weather map. If no fronts are in prospect between Middletown, O., and Bowie they probably will send one of their pilots for the plane within a day.

The AFAS pilot checks the airplane. Aeronca already has done that, but the AFAS pilot does it again. Only then, when everything apparently is satisfactory, does the ferry pilot sign a receipt for the plane.

In effect, the delivery is a shakedown cruise in the hands of an expert. Of course the factory, in accordance with CAA regulations, already has made a test flight.

At delivery, the pilot tells you in a formal report what happened during the trip and if he found anything wrong.

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INSTALL CHAMPIONS AND FLY WITH CONFIDENCE

Such trips often turn up minor flaws that were undetected in the first factory test flight.

That's service to the customer. Sometimes service isn't exactly orthodox, as on the day an AFAS pilot delivered a new lightplane to a customer in a southern city. This middle-aged man, to whom enthusiasm for aviation had come late in life, lived in another city many miles to the east. The delivery pilot gave the man the usual forms and reports, answered a thousand questions and toddled off for another delivery.

Three days later, in a city 350 miles north and considerably west, the same pilot was advised by airport attendants that a man was waiting patiently at the first airport for an AFAS pilot to fly his plane 600 miles eastward. It was the same man.

Private ferrying, its proponents point out, is the speedy method of getting delivery, too. At least one company has a back lot covered with planes waiting for customers or distributors to call for them. American Fly-Away has 25 regular pilots on the move constantly; National Aircraft has 15 regulars and a list of 60 part-time pilots. Some others have similar staffs. There's no pilot bottleneck with the ferry firms.

Speed can be pretty important to a dealer. A few weeks ago, two new planes earmarked for the same distributor left the factory three hours apart. By the time the second plane arrived on schedule, the first plane was almost completely reassembled in the distributor's show window, ready for an air show the next day.

Ferrying executives point with pride to the safety factor. Only seasoned pilots, they emphasize, handle new planes, and they fly them at minimum cruising speeds and according to the manufacturer's recommendations. Each company is fully insured and financially responsible. American Fly-Away recently made prompt payment for one plane badly damaged in a forced landing.

Economy is stressed by several of the newer ferry firms, but Wilder and Waggener, while declaring ferrying fees can be made as low or lower than any other aircraft transportation method, hold the opinion that many new ferrying firms are being a shade more than optimistic. The 10-cents-a-mile fee hawked by many is pure fantasy, the two ferry pioneers assert.

The reasons: Ten-spot termites, financial gremlins hidden cosily in the framework of any ferry system. Biggest single gremlin is the weather. Then there are crash and liability insurance; pilot time loss at the home base, delays at the factory or en route, inaccurate estimates on gas and, particularly, oil consumption; the fallacious "bee-line" flight plan; surface transportation costs; and delivery planning.

Weather is the bugaboo of plane ferrying, particularly of the light personal planes. AFAS plans to station its pilots at strategic factories. Thus, if weather grounds a plane, the pilot doesn't have hotel and food bills piling up during that time.

Lack of foresight may make this a hidden cost, just as it may make a forced delay en route through strange territory, where telephone and tie-down expenses add still more to ferrying expense.

Many people, even those more intimately connected with the industry, erroneously think in terms of "bee-line" flights from factory to consumer. Unfortunately only birds make those kind of flights, for the nation's airfields have an irritating way of being located zig-zag, boosting the mileage and the cost.

Insurance costs aren't to be shrugged off either. Ferry firms get more favorable rates for mass deliveries than do individuals. American Fly-Away, for instance, in some cases gets more than 50 per cent lower rates than dealers or customers would get for the same flight.

National Aircraft Ferrying has graduated fees for various trips. A ferry hop from Riverdale, Md., to a customer in Houston, Tex., a trip of 1,226 miles by NAFC figuring—would cost $171.50, or 14 cents a mile.

"In the future, we hope to get our prices still lower by correlating more and more flights," explains NAFC President Robert B. Hartman, former AAF officer. "It is very much within reason to expect a price as low as $135."

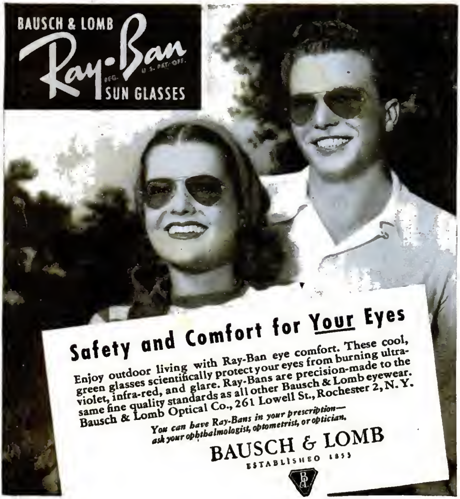
American Fly-Away rates are approximately the same. As soon as personal aircraft production warrants, 13½¢-a-fly-away-mile will be the rate to certain points for airplanes retailing for less than $2,600. Rates for aircraft selling for a greater sum will be only slightly higher, due to increased insurance valuation and operating costs.

The flight for lower ferrying rates, however, continues, and there are a number of ways they can be pared which are not available to the distributor, dealer or manufacturer. Chances are that when an order comes, American Fly-Away, for instance, will have a pilot within 100 or 200 miles of the factory. Bad weather isn't going to hold that pilot up, either, because he can always deliver another new airplane in a direction where the weather won't interfere. Furthermore, because of volume business, fly-away services have arrangements with certain airport operators to give gasoline discounts and free tie-down privileges during overnight stops.

Delays often occur at the factory. The CAA inspector fails to sign an airworthiness certificate or a magneto or other mechanism goes bad. American Fly-Away has solved most such delays by setting up a system of factory representatives.

Ferry pilots have made careful analysis of all methods of transportation in an effort to pare costs and they are constantly on the move, eliminating stand-by expenses.

One of the more clever means of cutting down costs is the establishing of "trans-fly bases" in strategic locations. Airplanes en route to a customer are



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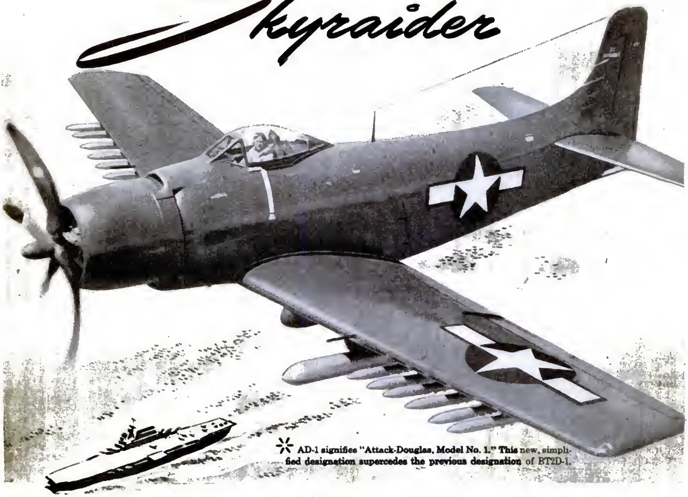
ATTACK-DOUGLAS

Skyraider



* AD-1 signifies "Attack-Douglas, Model No. 1." This new, simplified designation supercedes the previous designation of BT2D-1.

CHOSEN TO REARM THE NAVY'S POST-WAR CARRIER FLEET

● Outstanding characteristic of the Douglas AD-1 is its great load capacity: it carries *6,000* pounds of bombs, rockets, torpedoes, fire bombs, radar units or extra fuel tanks... *farther*... more than *50 mph faster*... than any other dive-bomber in service.

The unprecedented performance of the Skyraider results from major achievements of design simplification and production teamwork. For example—Douglas engineers made weight reduction a prime objective. Result: the AD-1 was completed at 1,800 pounds *less* than the Navy's acceptable weight, thus giving greater range and capacity.

The Navy wanted the AD-1 in a hurry. The Navy got it—from design start to test flight in 8½ months! Today a fleet of Skyraiders is taking shape on the production lines of the Douglas El Segundo Plant to equip the U. S. Navy with the safest, most versatile carrier-based plane of its great air arm. Thus Douglas once again meets the demand of the armed forces for a better airplane—in record time.

Such dependable performance, year after year, is the reason the Army and Navy—as well as the airlines—DEPEND ON DOUGLAS.

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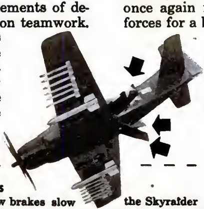

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Another Douglas First, these new brakes slow the Skyraider to less than 300 mph in vertical dives. In addition, they contribute to superb control in maneuvering, fighting and letting down.

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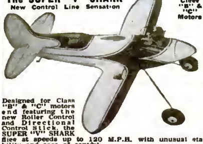

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brought to these bases in bad weather, or for overnight stops. The airplane can remain there until the weather moves on and the pilot, who otherwise would be grounded, can move to another area of better weather for another delivery. When the weather clears, the grounded plane can be moved by pilots who make short delivery flights out of that particular base.

"The dealer, distributor and manufacturer do not stand to gain anything by these lower rates in money saved alone," Hartman declares. "The consumer must pay the bill, regardless of what it might be. It is really the consumer who saves money by utilizing a ferry service. There is more to this ferry service than just a saving; and the dealer, distributor and manufacturer will profit by the many other advantages."

It's just like putting a stamp on your brand new airplane and mailing it—special delivery. END

15 YEARS AGO

FROM the November, 1931 issue of this magazine:

Some sort of record was indicated in the report that a test pilot, flying from the Akron Municipal Airport, made 489 take-offs and full-stop landings in one day while testing a new-type airplane brake.

A single-engined airplane was being flight tested by the Crawford All-Metal Airplane Co., prior to its being delivered in Mexico where it was to be used for an endurance flight. The plane was tested with a gasoline engine, but was to have a Diesel engine installed before delivery. Gross weight with two pilots, four passengers and fuel was 2,500 pounds.

Two Frenchmen announced their invention of a non-inflammable gasoline developed for aircraft engines. The gasoline would ignite in an engine only after passing through a special carburetor.

Speed of 140 m.p.h. over a measured course was obtained from a midget, 20-h.p. biplane used on the west coast for racing and exhibition purposes. Its wing span was 14 feet.

Boeing Airplane Company reported 820 workers were required at its Seattle plant to meet orders for Army and Navy planes. The company had the largest industrial payroll in Seattle.

Designed for a maximum in economic performance, a new plane called the *Time-Builder* had a nine-cylinder radial engine rated at 40 h.p. Maximum speed was 80 m.p.h. and stalling speed was 25 m.p.h. Price was $1,675.

The Vickers-Supermarine S6B won permanent possession of the Schneider Trophy for England, averaging 340.8 m.p.h. over a 217-mile course.

Ivan Makhonine, a Russian pilot living in Paris, announced his extendable-wing plane. The wing could be telescoped to nearly 50 per cent its span after take-off.

TIME DOES ACTUALLY FLY . . .
And so we can now announce that
AIRPORT OPERATION
and
MANAGEMENT
By Charles A. Zweng, is expected off the press September 1. The pre-publication price is $4.00 until October 30th when the regular price of $4.50 becomes effective. Remember this is a "First Edition" and the number is of course limited. All phases of Airport Operation fully covered. Illustrated. Comes in DeLuxe binding.
The "Timepiece" shown in the cut is (A Longines-Wittnauer Product) and known as the Weems navigation watch. It has a rotary verge ring which permits setting the sweep second-setting hand to the exact second—thus eliminating the "blind minute." Steel case, Price $43.75 Federal tax included.
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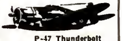

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HOW TO GET THE BEST RESULTS FROM "LUCITE"—*To clean off dirt and grit,* wash the enclosure with a soft cloth or sponge, in warm soapy water. Rinse the sponge often to remove grit. Finally, flush the surface with clear water and allow to dry.

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Plastics
BETTER THINGS FOR BETTER LIVING
...THROUGH CHEMISTRY

Stay Away from Thunderstorms

(Continued from page 33)

were about to butt a funnel. As I shall show you later on, the deadly funnels are quite small. They're ungrounded tornadoes, really, and they are spaced quite widely apart even in the worst conditions. So, you turn at right-angles to your course, and fly for about four miles. Now you turn in again on your heading through. In this way you will miss the funnel in that storm and also in the neighbor standing at its shoulder, if any be there.

The chances are remote that you will be headed for another funnel behind. That is, behind the first storm but dead ahead of you, but if this is not your day and you begin to have the chaotic evidence of nosing close to another one, you will repeat your previous dodge. Weather's carbuncles have cores. Keep out of the cores. You will get full satisfaction out of flying the funnel-less part anyway. At least I never felt neglected in the epileptic maw of a thunderstorm, where rain and hail rush and churn and whirl in every direction like frantic little souls before the wrath of heaven, where the infernal winds shriek down black corridors, and St. Elmo's fire bristles upon your plane as on a ghostly dog. No, I can't say I was bored.

The pilot who enters a thunderstorm, you perceive, must have confidence in himself, but it is a lot easier to have confidence somewhere else.

Let's get down to cases in this treatise of How Not to Fly Thunderstorms.

1. If you have an aircraft that is not all metal, don't fly unless you know for sure that there are no thunderstorms near. Water will get inside your structure from cloud moisture or rain, and a strike will leave you sitting up there with no visible means of support. This is inconvenient.

2. If you have an all-metal airplane, lightning can't hurt you—but turbulence will. If you fiddle around these bilious storms, sooner or later you will get caught blind and hit one. Very likely it will hit you back. Not many of them will tear you apart, though. After all, it only takes one.

3. If you are an airline pilot you can't help but fly through thunderstorms. I can't tell you what to do except some other kind of work.

From time to time during the first 10 years of your career of flying through thunderstorms you will think that you have achieved a cute technique for doing it safely, even neatly. What is the most dangerous thing about thunderstorms? *That is.*

Rules? There aren't any rules. Anything I can say will be wrong on some occasion. That is why old-time airline pilots usually don't write about thunderstorms. An art must be learned—it cannot be taught. Whatever I say from here on, the word "usually" is implied.

If you are over flat country and you can see your way under the storms, they are not bad. Steer to miss where the lightning is striking the ground fre-

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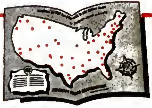

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quently. If lightning is all about—where you see it but it does not hit the ground—it must be cloud to cloud. At that spot is an open place between cores. Steer for it. Heavy rain spots are safe, too.

If you are in hills or mountains you have a different problem. You can't fly low, or down drafts will get you. Stay away from ridges and peaks if you can because they create chimneys. You want to miss the chimneys or cores. Up wind or well down wind of them is safest.

Whatever level you choose, stay away from the freezing level. That is where most planes are struck, and a strike can blind you for some time. The middle levels are the worst. There the chimneys will have their fastest jets of rising air, there turbulence is the fiercest, there icing is bad, there the freezing level usually is. What is the middle level? That's where Airways Traffic Control probably will assign you.

If you have oxygen or pressure cabins, the high levels are the best. You'll be flying in scarf clouds for a long way and you won't hear a thing on your radio on account of ice-crystal static, and you'll be lost. But your wings won't come off. Turn away instantly from the chimney tops that carry water drops to the heights. Even 10,000 feet above the freezing level the drops are not yet frozen—it takes time to freeze a drop suspended in air, a long time. But those drops will splash into ice instantly on your supercooled airplane. Turn away; you won't run right into another one, for they are rare.

Yes, it's jolly up high! But get out of your thunderstorm area—or at least the scarf clouds—before you come down. Don't think you are in alto-stratus, and have it a scarf cloud instead, and start down. But, if you want to know all of the surprises a thunderstorm can hold, go ahead. You'll hit them.

Fly in the lee of lakes, on the windward side of up-slopes. Fly under pre-warm-front and air-mass storms. A wide chimney has a slack draft. Watch out for the storm with a little fanny or a narrow waist, and especially the one with a tassel or a pot belly at the base of the cloud. They are not refined.

When you are flying at night, thunderstorms in the distance that blossom with red and blue and pink and purple fire look like the devil's flower garden. The mundane physical structure of the thunderstorm is a story that has been told many times, and I shall not tell it again here. Read the August, 1945, issue of FLYING, or refer to your encyclopedia. To this story I shall add two important things that I have discovered.

The two orthodox theories about how the electricity was made that creates those huge sparks called lightning were clever, but they could not account for the amount and the rapidity of charging. I noted that, no matter what the other conditions were, no storm was a lightning storm until the cloud went above the freezing level. Not being educated, I wondered why. My calculations and then laboratory tests showed that the forming of ice crystals would account for the rapid charging which permits stroke after stroke of lightning from a single cloud. Ionization at the freezing level, with crystal points lined up, is the reason that most of the airplanes that get hit get hit there. Keep away from it.

How frequent are tornadoes? If a tornado funnel or tail reaches the ground where people are, a tornado is reported. If it doesn't reach the ground it is not recorded. It makes no difference to an airplane, though. All that the funnel has to do is to reach the airplane. For every reported tornado there must be dozens that come into being aloft.

As you know, nothing can resist a tornado funnel, not only because of the terrific velocity of the twisting winds but because of the vacuum formed by centrifugal force. The funnel is not wide, having a diameter of from a few yards to something like the length of a city block. In short, the tornado is created by a strong spout of up-rushing air. As the shaft of air rises, it is given a circular motion, a twist, started by the earth's rotation. I believe that air mass rubbing along a low pressure trough contributes also. The point is that every strong up-draft, every rising spout, must spiral. If it is strong it is a tornado. Or, to appease the illuminati, it is a tornadoid.

Now, every thunderstorm is made by a rising column of air that gets its great power from the moisture in it, reheating itself through condensation as it goes up. Some of these updrafts within the nimbus cloud are quite strong and, let me emphasize, they all must spiral. They are in reality tornado funnels. These funnels are extremely dangerous because of the terrific angular acceleration of the air, and of the very

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Out of the war has come one blessing—a lesson in thrift for millions of those who never before had learned to save.

Enrolled under the Payroll Savings Plan in thousands of factories, offices, and stores, over 27 million American wage earners were purchasing "E" Bonds alone at the rate of about 6 billion dollars worth a year by the time V-J Day arrived.

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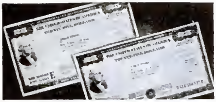
The moral was plain to most. Here was a new, easy way to save; one as well suited to the future as to the past. Result: Today, millions of Americans are continuing to buy, through their Payroll Savings Plan, not War Bonds, but their peacetime equivalent—*U. S. Savings Bonds.*



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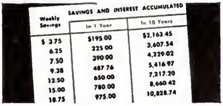

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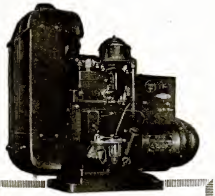

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sudden lowered pressure (vacuum) in the whirling column.

It seems clear enough that a great many thunderstorms, especially those along a trough or a cold-front wind shift, must hide tornadoes of varying intensity. These are what the airline pilots must miss. It has been my experience that these tornado funnels or chimneys are quite narrow, spaced widely and of short duration.

If an airline pilot can see the base of a thunderstorm cloud, and he notes that the cloud sags down in a spot usually near its front part, or has a tassel there, he will go elsewhere with some gusto. When blind, the job is harder to do. But some distance from the funnel he will have evidence of approaching it for, like the whirlpool in an emptying bathtub, its influence reaches out to the side, for a quarter of a mile or so. There is a sudden lowering of temperature, the plane lifts rapidly, usually a wing flops up and holds there for a moment or two, the gusts are slapping, they snap, and the most important diagnostic system is the side gust, for if the plane is shoved or knocked sidewise there is no longer any chance to confuse ordinary thunderstorm turbulence with the interior tornado.

The hidden tornadoes do not last long; I would guess five minutes. For that matter live thunderstorms do not last long, either. With some exceptions, a thunderstorm is triggered off in about 10 minutes, and lasts only about 20 minutes since it shuts off its own power because the cold rain cools the ground as does even the shadow of the cloud, and the up-column of hot, moist air cannot feed at that spot any longer. The airline and CAA people treat a reported thunderstorm in their rules and procedures as though it were a sort of fixture. However, the pilot knows that the thunderstorm that is reported is never there by the time his clearance is written or by the time that he gets to the locality, and the one that he does meet is never reported. If conditions are ripe, one thunderstorm will bloom and wither, and another in the vicinity will pop up. The authorities seem also to believe that a thunderstorm moves in the same direction as the front moves, say southeast on a cold front. But the thunderstorms really move along the front, in this case to the northeast—"usually."

The horizontal shearing action of the air masses of a line squall seems to cut off or pull out the funnels that might have ambitions toward being hidden tornadoes. I have never found a tornado in a line squall. There may be some near a line squall, though. Be very suspicious of the rather rare and localized phenomenon where a layer of cold air overruns a warm, moist layer, for this is an ideal set-up for hidden tornadoes.

If you meet a series of what airline pilots call bears or dragons, it's like fighting the Japs. The nice rules, especially the bureaucratic pass-the-buck alibi rules, are off. This is a personal matter. Choose your altitude wisely. Think nothing of leaving the airways. Forget the rules that say you cannot protect the lives of your passengers, for to the airline pilot the only sacred thing is his passenger. Remember that what CAA doesn't know about flying would fill a lot of books. END

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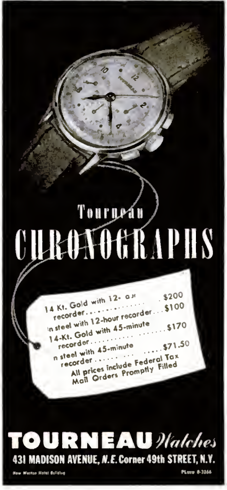

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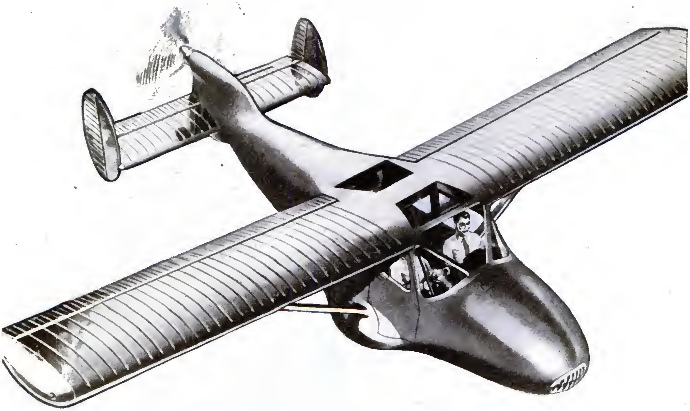

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The Bellanca Cruisair

(Continued from page 36)

under excellent conditions. The temperature was about 75 and the wind approximately 10 m.p.h. Only Ray Barber, Chicago Bellanca distributor, and myself made the flight. The airplane weighed 1,760 pounds at take-off—340 pounds under maximum. From a standing start I made a cross-wind take-off in 12 seconds and climbed to 2,009 feet at well over 1,000 f.p.m. I made another climb, from 2,200 to 3,200 feet above sea level, at a rate of 1,030 f.p.m. Bellanca claims 1,130 f.p.m., presumably with a full load, although the average private pilot should be content with an honest 1,000 f.p.m. That's substantially better than a lot of other private planes are able to do today. One other point: the Bellanca I flew had a fixed-pitch Sensenich propeller, although the airplane's best performance is had with the automatic Aeromatic propeller, which costs $295 extra.

The *Cruisair Senior* gets off the ground in a hurry. From that point on, the pilot is busy—a little too busy, was my immediate reaction. If he used flaps to help him get out of a tight field, he's even busier. Here, for instance, is what you do on a standard take-off:

Throttle wide open, you get the tail up as soon as possible, holding your heading with brakes (the tail wheel is full-swiveling and can neither be locked nor steered). As the airspeed needle crosses 50 m.p.h. you ease back on the control wheel. Once in the air, you set your climb at 80 m.p.h., the throttle wide open. (That throttle is interesting, incidentally. It does not have the conventional screw-type lock to hold it at a given setting. Instead, it can be turned sideways in either direction, automatically locking it in that position.)

Of course, your nose is high during take-off, and your visibility forward is not at its best. You're also climbing out of what usually is a busy airport, so you've got to keep a sharp eye out. But at that point you must start retracting the *Cruisair Senior's* landing gear. This is no small feat, especially during the take-off.

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Stalling speed (with flaps)	40-45 m.p.h.
Range fully loaded	600 miles
Service ceiling	17,000 feet
Rate of climb @ sea level	1,130 f.p.m.

Source: Bellanca Aircraft Corporation

The landing gear is operated manually. The crank handle is at the front and center of the double front seat, between pilot and passenger. I counted over 30 turns of the crank before the gear locked in the up position during one take-off. It takes the same number of turns to get the gear down. Thirty-some turns of a manual crank that you have to bend over to reach is a chore I'd rather not do, especially during the two most crucial points of a flight: landing and take-off. Of course, if you're carrying a passenger in the right-hand seat, the gear and flap handles will give him something to do. I would prefer to entrust them to someone else anyway; both are difficult to operate. The flap handle is well forward under the dash between the two sets of rudder pedals. To reach it you must bend down and forward, take hold, then pull back for the amount of flap desired.

In the air, the Bellanca's performance should charm the cross-country pilot. The seat is comfortable, there is plenty of leg room, and you don't have to work constantly to keep the plane right side up and headed straight. The airplane is inherently quite stable, and has a very effective elevator trim tab. Two or three turns of the overhead handle give you an immediate and sharp climb or descent. Once set in level flight and trimmed for cruising, the *Cruisair Senior* makes an excellent cross-country airplane; the controls have little tendency

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to flop around loosely when rough air is encountered.

At cruising speed, the Bellanca has excellent maneuverability. The slightest control pressures get immediate response. Also, this airplane is the next thing to a two-control airplane; I flew it through an entire series of turns without once touching rudder. An unsuspecting passenger would never have known the difference.

The *Cruisair Senior* shines at low speeds, too. Where most airplanes with comparable performance must be handled gingerly when flying low and slow, the Bellanca should be quite safe for a lightplane pilot with limited experience. It will forgive many mistakes an amateur pilot might make at low speeds. With flaps and gear retracted, I pulled up the nose steeply with power off. Because the elevator travel is limited, I would have had to dive the plane and then zoom upward in order to completely stall it.

When you just ease the nose up from level flight into the stalled position, the Bellanca slows down to an indicated air speed of between 45 and 50 m.p.h. When it is ready to drop its nose and pick up minimum speed, the plane just shudders slightly, then dips forward. I found no tendency to fall off on a wing, and there was aileron control at all times. While I did not try to spin the airplane, I'm told that it must be deliberately flown into a spin, and that it's a pretty hard thing to do. Nevertheless, there is a prominent placard in the middle of the instrument panel: "Intentional spinning prohibited."

Minimum flying speed at which altitude can be maintained is 50 m.p.h. This can be done at 1,200 r.p.m.

Visibility in the air is good, particularly to the front. It's a little difficult for a tall man to see out the sides; he must stoop over slightly. On the ground, with tail down, it's a little more difficult to see over the nose, although the *Cruisair Senior* is better than average in this respect too.

A normal landing in this airplane should be easy for the amateur to master. First, the Bellanca has a low stalling speed. Then, the large flap extends at a 46° angle, giving the pilot a steep approach and excellent forward visibility. The flare-off is quite normal and easy, and the airplane sails along nicely just above the runway until it loses flying speed, then settles gently onto the field. No sudden stalls in which the pilot finds himself sitting in an airplane that suddenly quit flying and dropped to earth like a dumped tractor, all but out of control. This is another of the Bellanca's "tame" characteristics that makes it a good airplane for the amateur.

The cabin of the *Cruisair Senior* is not the most attractive among the newer airplanes. The instrument panel is finished in a rather loud blue stipple paint; the dual control wheels are covered with the same stuff. The seats themselves are adequate, although the back seat is uncomfortable for a tall man. I'm 5 ft. 11 in. tall and my head bumps the ceiling in the rear seat. It's also just barely wide enough for two average people. The single cabin door is on the right side. The general appearance of the interior could well stand the attentions of a first-class interior decorator—a failing of so many private airplanes these days. The customer should get a finished product at least as attractive as anything else that costs as much ($5,950 f.a.f.) as this plane.

One of the worst faults I found with this Bellanca was the noise. It was worse than average. This particular airplane—although it had been delivered from the factory as a finished product—did not have an engine muffler.

The fuselage is the conventional steel tubing, covered with fabric. The wings are wood, with a plastic-bonded plywood skin. There are plenty of inspection plates for maintenance work. The engine cowl is hinged and opens upward, giving easy access to the engine.

Although the *Cruisair Senior's* performance already is quite good, it could be even better if much of the hardware sticking out into the slipstream could be removed or faired in. The landing gear, for instance, sticks out several inches beneath the wings when retracted. The tail wheel doesn't retract at all. There also are large external aileron and rudder hinges. And the two side fins on the horizontal stabilizer probably don't help much either. Yet, despite these protrusions, the Bellanca turns in better-than-average performance for its horsepower. But I can't help wondering how much better an airplane this might be if it were turned over to a team of top-notch aeronautical and production engineers whose sole assignment would be to clean up and get the very best out of this excellent design.

The standard *Cruisair Senior* is far from complete for efficient cross-country flying. Only "standard" instruments are a compass, air speed indicator, altimeter, tachometer, temperature and fuel gauges. Everything else — radio, other instruments, landing lights, Aeromatic propeller—is extra, taking this airplane well into the $6,000 class.

While the airplane I flew was picked at random, it was a standard delivered model, so it can properly be assessed as being the sort of thing an average customer might get. Some of the windows were loose-fitting; the roar of the slipstream around them contributed materially to the din.

Knowing as I do Bellanca's ability to build airplanes with excellent performance, I can only hope that he will take drastic steps to eliminate these annoyances. Customers tolerated them in pre-war days, but Bellanca now faces stiff competition in his class for customer favor, from North American, Beech and Fairchild.

Nevertheless, I would say that the *Cruisair Senior* is a "must see" on your shopping list, if you're looking for four seats, good weight-carrying, good performance for low horsepower, and inherent safety. If you can talk your wife into overlooking the airplane's poor "packaging," you should find this an excellent airplane for cross-country business or pleasure trips.—MAX KARANT.

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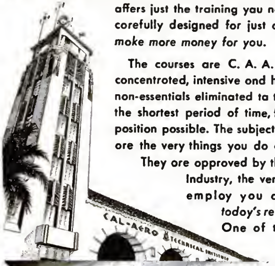

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Report from Washington

(Continued from page 51)

and advanced trainers, 868 transports except Cessnas, 789 Cessnas, and 728 miscellaneous. WAA points a sound moral for the industry: "The sale of 16,097 surplus aircraft," says the Administration, "demonstrates that a volume market exists for reasonably priced airplanes with civilian utility. . . . There is every probability that the potential market for new aircraft is more extensive than indicated by this study [since] these planes represent used planes which were not built to meet civilian needs."

Research

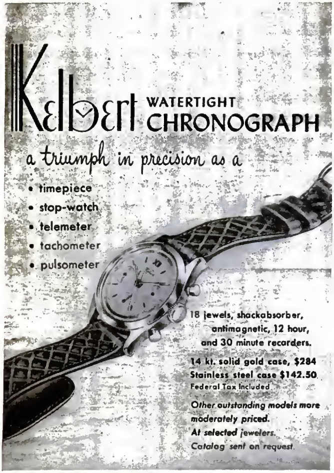
Almost unnoticed, even by the industry, was the recent prediction of Senator Hugh B. Mitchell of Washington that in the near future Congress will be asked to appropriate "sums for basic and applied research in aeronautics approaching the billion dollar mark." He added: "The time has come, in my opinion, for a group of outstanding citizens to appraise these various efforts (in aviation) and mark out a course for America's air future." How accurate his prediction is only the future will tell, but this much seems certain after interviewing experts on The Hill—big money is going to be laid on the line for development of AAF and Navy flying equipment. Little of the money will be allocated to research in the civilian field, with the possible exception of transports. Or at least that's the belief at this time.

Red Tape

If you think you run into trouble on a domestic flight, try one abroad. You'll come home thinking American style is pretty snappy, at that. Internationally, the situation has become so bad that even the Provisional International Civil Aviation Organization (PICAO) is doing something about it. To PICAO's credit, they haven't minced words—the difficulty is "the mass of red tape which now surrounds and hampers international air travel." Sir William Hildred, director general of the International Air Transport Association, co-ordinating agency of world air-lines, is organizing regional committees to back up PICAO's effort. Says Sir William: "It is senseless to advertise that by patronizing the airlines a New Yorker can weekend in Paris if he must spend as many days filling out documents and waiting for visas as it takes hours to make the flight." Pilots also have their troubles: "On one route alone, the captain of an aircraft, whose ostensible business is to be a pilot, must sign or initial 527 documents for his plane, passengers and cargo." Seems that bureaucracy isn't such an out-and-out Washington monopoly, after all. . . .

Briefings

Henry Wallace's wrong-way flight story, which appeared recently in Washington papers, was correct except for one detail. Wallace did take off before admiring friends at National Airport, cruise around, and then land to take a bow—at Baltimore instead of Washington. The detail: the flight was last December, not August—as the newsmen would have had you believe. . . . The first Martin 202 is scheduled to fly this month and the first Martin dive bomber for the Navy is already in production. . . . Aircraft Industries Association probably will not have a paid president, though aviation periodicals have suggested Lieut. Gen. Oliver Echols might be featured for the top job. Best bet is that Alfred Marchev, president of Republic, will become next head of the organization, serving without pay. And we might add, with his usual efficiency and high-octane enthusiasm. . . . Reputedly, there are three backers with lots of folding money for John Geisse's airplane U-Drive-It service along the eastern seaboard. Geisse recently resigned as head of the personal flying specialists unit at CAA. He'd been with the Administration for nearly a decade. . . . CAB is working overtime hoping to have a complete feeder-airplane network okayed nation-wide before the end of the year. Biggest suggestion looming on the 1947 docket: will the feeders pay? CAB, without having much to go on so far, is reasonably sure they will. END



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The Bomb

(Continued from page 23)

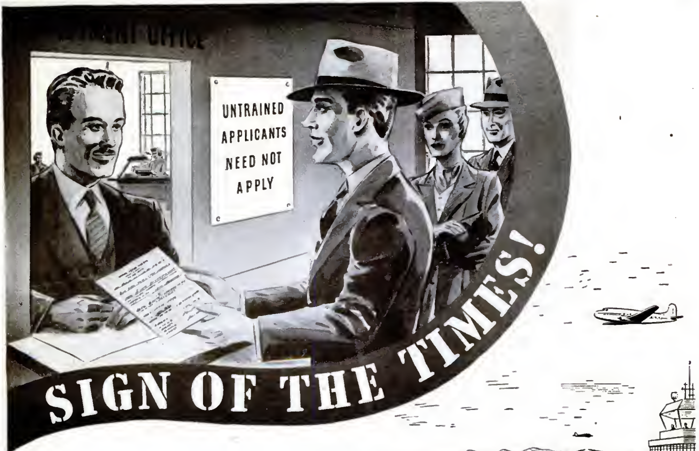
vance publicity build-up, half expecting it would explode the world along with itself, the bomb was something of an anti-climax. Newsmen who witnessed the explosions added to the wishful thought that maybe it had been overemphasized. But the reporters were a long way from the explosion. They had to be for safety's sake. They were disappointed and said so. The bomb did not even sink all the target ships. As for exploding the world, that was a joke—or was it?

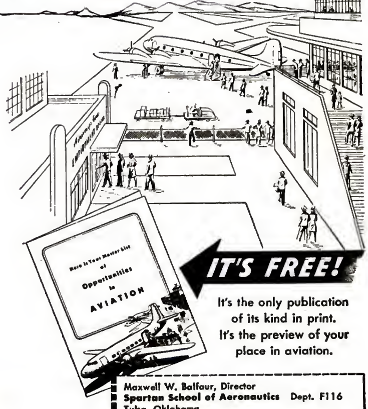
No reporter nor any other man saw the two explosions as well as they are pictured here. For these photographs were taken by shielded robot cameras anchored to steel masts on the atoll of Bikini, and by cameras in robot planes orbiting about the brilliantly exploding atomic mushroom.

Planes filled important roles in the Bikini test. Mother planes guided robots. The robot planes themselves performed numerous duties. They took photographs, measured radioactivity, collected samples of the atomic cloud. Aircraft will fill even more important tasks in the atomic world ahead—whether those aircraft be operated by men or by robots or are powered by propellers, jets or rockets.

An insight into tomorrow's air force may be seen through the atomic clouds at Bikini. If a war is to be fought with atom missiles, what do you need in an air force? A few giant bombers, certainly. A number of long-range, guided missiles with atomic war heads. And what do you need for defense? Detection devices of a speed and accuracy unknown today. Very fast fighters to intercept the bombers. Very fast robot weapons to intercept the guided missiles. A fleet of big transports, to be protected by long-range fighters for carrying airborne troops. That is your air force—a long way from any air force existing today.

Here is your bomb, then. It is a weapon conceived in terms of the airplane, developed as an aerial missile. The men who measured its results over Hiroshima and Nagasaki know what it would do to a land army. The Bikini testers saw what it can do to a navy. They watched the underwater bomb lift a million tons of water like a giant inverted bowl. They saw it raise ships bodily. Their only conclusion is that it has brought a revolution to war—and to mankind. END

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Two Gals and a Plane

(Continued from page 42)

ess. and in the morning we picked oranges for breakfast from trees outside our bedroom window.

On the second landing we were really in trouble, almost zero-zeroed in a ground fog that caught up with us near Uvalde. We finally crossed our fingers and landed on what looked like more fog but (we hoped) would turn out to be a runway. It did. The joke being that when we taxied up to the hangars we were greeted by half a dozen instrument pilots with fancy twin-engined jobs who had been sitting there for two days, afraid to take off in that kind of weather.

Our all-time favorite forced landing and the one we're most proud of was at Antlers, Okla. We took off from Dallas after the Red Cross called for volunteers to fly blood plasma to Antlers, which had been struck by a hurricane. We landed in a space that looked about as big as a back yard and delivered the plasma. I held my breath when we took off again in the face of trees that looked as tall as mountains. Gypsy did her stuff like the perfect lady she is, and we got a wonderful letter from the Red Cross. That is our most prized souvenir.

Speaking of souvenirs reminds me—this silly talk you hear about how expensive it is to fly. All I say is, it can't be. Fran and I never have made much money. We usually get jobs together as waitresses. Sometimes I do typing, and occasionally I tell fortunes. It's no way to get rich, but we've managed to live pretty well and do all the flying we wanted on what we've earned. Besides, I'm taking lessons toward my commercial and after that I'm going to study for an instructor's rating, so that when we make one of those forced landings of ours I can try to sell some of the folks that come running to the plane on either taking a ride or learning to fly.

As for the cost of keeping *Gypsy* going, all I know is I figured it out the best way I could recently and gas and oil for the 20,000 miles (according to my receipts) ran less than $100, hangar rent was about $80, repairs about $20. That figures out to one cent a mile. That's my story and I'll stick to it. I'll bet you can't find one of these solemn male operation experts who can beat it! Of course, there's that $56 for the 100-hour overhaul.

Fran and I are heading for Vermont as this is written. Then we're going to Cleveland for the air races and from there to visit our folks. Next stop Florida; warmer in the winter. Besides, we hear there are pilots there who can tell us about flying in South America . . . END

London Letter

(Continued from page 56)

of the Air Registration Board indicate that the rise is steady.

By June of this year there were 650 civil aircraft, 223 of them transports. At the end of 1945 the total number of aircraft with valid certificates of airworthiness was 248—148 of them transports.

Deauville

Opinion about the Deauville air rally is unanimous. It was all that an air rally ought to be and all those who flew over from England enjoyed themselves and did not necessarily have to spend large sums of money in doing it.

Speed Record

I write on the eve of an attempt to establish a new world speed record. The *Meteor* and its *Derwent* engines are almost ready—all that remains is to get the right kind of weather.

Although Britain's High Speed Flight will do all it can to put the record to the highest figure possible with a normal type of aircraft, the members all hope that there will also be an American attempt.

The 4,200-pound *Derwent* engines for this year's *Meteor* are made of new materials which enable higher jet temperatures to be employed. Apart from the cockpit hood modification the aircraft are almost the same as last year. The attempts will be made under the F.A.I. [*Federation Aeronautique Internationale*] rules.

Speeds just over 1,000 km/hr., or 621 m.p.h., will not, as was first thought, win the Bleriot prize, which requires doing the speed under special conditions. The Bleriot prize, in fact, is for sustained speed in excess of that rate. When Bleriot offered the prize many years ago, he was ridiculed for suggesting a speed which then seemed far beyond the range of possibility. END

Letters

(Continued from page 6)

towards the rear so that it is quite impossible for two normal people (by that I mean persons about five or six feet in height, weighing from 125 to 200 pounds) to be seated comfortably.

Visibility from most small planes is poor. Recently I rented a four-passenger plane and flew it to Atlantic City. Since I did not provide myself with extra cushions, I had a very uncomfortable ride. The only time I could look over the nose of the ship was when I pushed the nose down. Otherwise, I looked through the door windows and watched the compass And what a compass! With the slightest movement of the plane the compass moved 30° to 50°. Since that plane sells for about $5,000, I believe better instruments could be provided.

Another factor that needs consideration is the elimination of noise. After flying some small ships, it takes an hour or longer to regain one's normal hearing.

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AGE

Q. My age is 25. Am I too old to take up training in Aeronautical Engineering?

A. No. The average age of men enrolled in Northrop Aeronautical Institute is 24-plus. Some have entered directly from high school. Others have entered after long periods in the armed forces, their ages extending up into the middle thirties. Age is of little importance—educational qualification and personal determination to succeed are the essential factors.

EDUCATION

Q. I am a high school graduate with only two years of mathematics. Am I qualified educationally for your Aeronautical Engineering courses?

A. Yes. Our entrance requirements conform to the standards prescribed by the National Council of Technical Schools, which specify satisfactory completion of a 4-year high school course, or its equivalent. In many cases, practical training and experience—particularly in the armed forces—take the place of a more formal education.

SERVICE EXPERIENCE

Q. I was in the service 46 months. Is this experience of any general or specific value to me?

A. To give an exact answer we should have full information on training and duties. Many types of training and experience in the service give a student an aptitude for grasping technical subjects. Also, we have observed that a service background gives a man a sense of responsibility that leads him to strive for success in his studies.

AIR SERVICE EXPERIENCE

Q. I was in the Air Force, first as a mechanic, then as a fighter pilot. Will this experience help me in studying to be an aeronautical engineer?

A. All types of air crew and ground crew experience contribute greatly to grasping aeronautical engineering subjects, and to becoming a better engineer. Knowledge of aircraft structural details, maintenance problems, performance, design, and flight characteristics helps the student make practical interpretations of his daily study and apply practical considerations in his assignments.

DIFFICULTY OF TRAINING

Q. I know I would like an Aeronautical Engineering career but I am afraid the course of training might be too "tough" for me. What do you advise?

A. That depends upon the strength of your desire for a career and your determination to succeed. If a man has the proper educational qualifications he can take up an Aeronautical Engineering course with confidence. Our training program carries the student steadily forward from his basic qualifications.

LENGTH OF TRAINING

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PENCIL BEAM FOR GCA

I notice in "Lightplane Radio Review" (September issue) that one of the transceivers was equipped to receive the 75 mc. marker beacon. That brought to mind an idea for eliminating one of the few objections to the ground-controlled approach system; namely, the possibility of error in identifying a particular plane when several show up on the screen.

If the ground operator had manual control of a narrow pencil beam (in addition to usual radar equipment) which he could point at will towards a given plane by referring to the co-ordinates on the control scope, a very simple transponder aboard the plane would confirm its identification. With the interrogation beam spotted on the plane in question the GCA operator would hear the pulse tone of the beam when the pilot "pressed to talk" in acknowledging the operator's instructions.

Only modification in equipment required would be to replace the 75 mc. marker beacon receiver by an insensitive one tuned to the radar band, with necessarily more complicated antenna system and feeders. The radar receiver would directly feed into the speech amplifier of the 3105-kc. transmitter used for routine communications. This would prove more useful than the 75-mc. beacon receiver when GCA becomes more universally applied.

Leo Mackta
Brooklyn, N. Y.

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CUB COUPE J4A 1940. Completely reconditioned for resale. Relicensed by CAA. Wings just recovered, ship refinished inside and out. Never damaged, always hangared, one previous owner. Smartly equipped for business, pleasure, flying club, or rent. Approved Escanaba skis ($35.00 extra). Prop and windshield covers and control lock for overnight tiedown away from base. Sensitive altimeter, time recorder, ball bank. Less than 200 hours on engine top overhaul. Latest engineering changes on previous factory major. 1150 hours total. All reconditioning completed and ready for immediate delivery. $1,965. Phone 897W, write or wire Apt. 4, 115 Ballard St., Ypsilanti, Michigan.

PIPER J3C65, 300 hrs. total on aircraft. 167 hrs. since engine O.H. Brakes both cockpits—lights. Licensed day night contact. $1,850.00. Siskiyou Airways, Montague, California.

PIPER J3F65. Relicensed June. Perfect fabric. Brakes both cockpits. 400 hrs. total on new engine. 10 hrs. since O.H. Very clean. $1,750.00. Siskiyou Airways, Montague, California.

PORTERFIELD

FOR SALE; Porterfield 1941, relicensed—$1450. Earl Penn, Pawhuska, Okla.

REARWIN

1941 REARWIN Sky Ranger 180F Sensitive Altimeters, eight day clock, wheel pants, Scott Tailwheel. Time recorder, Radio receiver, Starter, New Battery. Just relicensed less than five hundred hours. Perfect condition. Priced at $2475.00. Donald Dice, Dice Tire Service, Crawfordsville, Indiana.

RYAN

2 RYAN PT-22s. Very clean; low time. $1650.00 and $1450.00. Southwest Aircraft, Inc., Meacham Field, Fort Worth 6, Texas.

STEARMAN

STEARMAN, A-1 condition, 80 hours since engine overhaul. Red and yellow finish. This is one of the cleanest PT 17's available for $1,795. Will deliver for expenses. Gates and Meade Flying Service, P.O. Box 38, Fortuna, Calif.

TWO exceptionally clean Stearman—both attractively refinished. Both have Primary blind group in both cockpits. One just licensed, the other being licensed. Best offer takes them. Hal White Route 2, Battle Creek, Mich. Phone 26-1327.

STINSON

STINSON 10, 80C. Just recovered and relicensed, radio and lights. Arthur Curtis, 6909 Oakridge, Hyattsville, Md. $3,000. Will trade.

WHY buy a bare ship? My Stinson 105 with 2-way radio, Turn and bank, Rate of climb, Extra gas tank and attractive blue finish. $2600.00. Emerson Steward, 32 Jefferson St., Phone 1529, Bridgeton, N. J.

L-5 STINSON: Lycoming 185, starter, navigation, landing lights, full instruments, two-way radio, $1875. Lawrence Allison, 632 N. 7th, Lawrence, Kansas, Phone 1597-W.

L-5 STINSON, "Flying Jeep" just licensed, finished in Insignia Red. Ideal for Ranchers. Engine 402 hrs. Complete blind flight group, two-way RCA 15 watt transceiver, electric starter, generator, landing lights, new Bendix loop just installed. Owner buying larger ship. $3250. Southern Skyways, Municipal Airport, Houston 12, Texas.

FOR SALE: Stinson Reliant model V77 painted beautiful nile green with black trim; just licensed, inside completely upholstered in mohair total time on aircraft and engine 85 hours, full set of instruments. If you enjoy driving an expensive car this is your ship—how much am I offered? Petit Aero Service, 1032½ Oxford Avenue, Eau Claire, Wis.

STINSON Voyager 10-A, Franklin 90, NC-31578, two-way radio, navigation lights, starter, ten hours since hundred hour, $2750.00. W. D. Pahnke, 1651 Vincennes Ave., Chicago Heights, Ill.

STINSON VOYAGER — Deluxe 10-A Just relicensed 3-place, engine overhauled, 438 hours total. Blind flight instruments: Turn-Bank, rate of climb, Clock, Sensitive altimeter, Lear receiver transmitter, directional loop. Starter, wheel pants, Landing light, new plexiglass, extra propeller, Fabric excellent. Have larger ship coming, best offer accepted. John M. Stroud, 33 Bellview St. Chagrin Falls, Ohio.

TAYLORCRAFT

L2M TAYLORCRAFT; low hours, good condition, privately owned, hangared. Relicensed in July. A bargain at $1750. D. W. Augustine, 207 Greenway, Aberdeen, So. Dakota.

1946 TAYLORCRAFT, Demonstrator. Wheel pants, radio, cruising range four hours. $2,575.00. 1939 Taylorcraft, BL65, Pressure cowling, just relicensed and recovered. Ship in perfect shape. $1800.00. Matoon Airport, Matoon, Illinois.

1946 NEW Taylorcraft Demonstrators, list $2850, for quick sale $2400. Lyons Flying Service, Lindenhurst, L. I., N. Y.

TAYLORCRAFT: model BC-65 used parts. Overhauled March 1946 for sale. Landing gear complete includes: Cables, brakes, wheels, tires, $125. Left wing intermediate fabric. Piper yellow, $275. Left main lift strut $15.00. Left and right rear lift struts $10.00 each. Instrument panel with instruments includes sensitive altimeter, $30.00. Damaged fuselage cheap. Rt. and left horizontal stabilizers and elevators $25.00 each. Insignia blue finish. Continental engine, 30 hrs. since major, all new parts, including crankshaft and valves, carburetor, propeller, and new baffles with engine, $325. K. H. Herridge, 1842 Shely St., Corpus Christi, Texas.

1943 TAYLORCRAFT, L-2M, Licensed, Insured, re-covered with Grade-A fabric, hand rubbed finish. Excellent visibility—one piece "lifetime" Plexiglass windshield, windows, ideal for sightseeing, aerial photography. Continental A-65 just overhauled. Complete flight, maintenance records from acceptance by Army from factory to present. New Propeller, "Air Boy" receiver. Sensitive altimeter, standard flight engine controls. For information and offers to buy, write: F. P. Conant, 65 East 96 NYC, N.Y.

FOR Sale: Taylorcraft 1941 deluxe BF-12-65. Lights, radio. Good condition and relicensed. Don Gridley. Ypsilanti, Mich. Phone 1384-J3. $1800.

NEW 1946 Taylorcraft BC12D, Continental 65. Radio receiver, 24 gallon gasoline capacity, navigation lights. $2500. Ocala Aviation Sales Company, P. O. Box 501, Phone 941, Ocala, Fla.

TAYLORCRAFT BL55. Licensed July 1, 1946. New prop, new plexiglass windshield, recently recovered. 310 hrs. since major. Price $1050. Harold T. Hamlen, P. O. Box 53, E. Stroudsburg, Pa.

TAYLORCRAFT DC-65 1942. 445 hours. Continental 65 engine. Good condition. Any reasonable offer accepted. Frank Bruno, 601 E. 2nd St., Plainfield, N. J.

TAYLORCRAFTS—L2B, $1400.00. L2M, $1600.00. Both good condition, flying every day, must see to appreciate. Good buys on 1946 Deluxe T-Crafts. Via Air, St. Clair County Airport, Port Huron, Mich.

1946 TAYLORCRAFT BC, Maroon and silver. Less than 100 hours. Manufactured June, 1946. Radio receiver, 24 gallon gas. A bargain at $2495. Niederhauser Airways, Marshalltown, Iowa.

1946 TAYLORCRAFT BC, black and red. 300 total hours. Lights. 18 gallon gas capacity. Very clean, and a real buy at $2195. Niederhauser Airways, Marshalltown, Iowa.

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TAYLORCRAFT 1941 DeLuxe side by side. Linen less than two years old. Always hangared. Topped in January. Relicensed in June. Outstanding paint job. Excellent upholstering and a dandy ship to fly. Will take car in trade. Priced low at $1695.00. 1946 DeLuxe Taylorcraft side by side with two wing tanks, lights, aircleaner and radio. Total time of 52 hours. $2295.00. Will deliver either job for expenses. Earl W. Sutliff, Evart, Michigan.

VULTEE

BT-13B—NC62645, 270 Hrs. on engine since major. Ship just refinished, red trim. Radio and instruments complete, front and rear. Excellent condition. $1650.00 includes two chutes, one new. Max Oeck, Sherwood Field, Paso Robles, Calif.

BT-13A, NC 64505, built 1942. Total hrs. 1809:30. Engine 207:30 hrs. since overhaul. Transmitter, Receiver, Artificial horizon and directional gyro in both cockpits. $1500.00. Paul Boat, Sully, Iowa.

BT13A. JUST finished licensing, day, nite instrument. $1450. Will paint for $50.00, deliver for expenses. Jack Wittgren, 544 E. 79th St., Chicago, Illinois.

VULTEE—BT 13A Radio, Two set instruments, 95 hours on engine. $1750 or will trade for lighter plane. Blaine Farmer. Box 23, Greene, Maine.

FOR Sale or Trade: Fully licensed Three-place side by side rear seating arrangement, Vultee (BT-13B) Airplane equipped with steel spinner, latest radio which includes two receivers, one transmitter, and an excellent marker beacon. Full panel instruments in front, rear compartment upholstered, fully floored, and sealed in with leatherette. Radio box retained in passenger compartment. Licensed for three persons, 15 pounds baggage. This airplane bought December, 1945 and was pick of hundreds when bought. Converted to three place immediately and completed in April, 1946. Time on ship and engine approximately 480 hours since new. Tires like new. Have one other Vultee, and prefer to trade this Vultee for Cub, but will sell outright for not less than $2500.00. If interested contact—R. M. Edward, Jr., Route 4, Longview, Texas. Phone 9062-J-2.

2 BT 13's LICENSED night instrument and refinished throughout March 14, 1946. Two way radios. NC62824 has 48.40 on engine and 393.40 total time on aircraft. NC62825 has 9.20 on engine and 579.40 total time on aircraft. Cleanest craft in the country. Your choice. $1750. Also Waco UPF7 relicensed Feb. 1946. My personal airplane—good condition. $1650.00. J. C. Everitt, 701 W. Central Ave., La Habra, Calif.

WACO

WACO UPF-7: Mfg. August, 1942. Relicensed and refinished June, 1946. Beautiful hand rubbed maroon and cream finish. Curtiss-Reed prop, starter, generator, new battery. Two-place factory front seat installed. 300 hours since engine major. Must be seen to be appreciated. R. A. Straker, Box 518, Wooster, Ohio. Phone 1135-W.

WACO Cabin UEC 4 place, 210 Continental, only 40 hrs. since major, recovered and completely rebuilt. 2 way RCA radio, loop, landing lights, navigation lights, flares, T&B, RofC, Sensitive Altimeter, clock. $4650. Will trade. Austin, 7735 Walnut, Kansas City, Mo.

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WACO Custom Cabin. No time since recovered and engine majored. 285 Jacobs cruises 140 mph. $7500.00 Southwest Aircraft, Inc., Meacham Field, Fort Worth 6, Texas.

WACO UPF-7 three place, just converted with factory kit, metal prop, starter, blue fuselage, yellow wings, licensed until August 1947, just what you're looking for to make money hopping passengers, $1585.00. Harman Aviation Service, Kenosha, Wis.

MISCELLANEOUS

FOR Sale: Several Stearman Crop Dusters, low engine time, clean ships with Hopper installations that work. Cardwell Crop Dusting Service, Bryan, Texas.

L-K 10A SAILPLANE, 2 place, new condition including trailer, canvas, two nylon tow ropes, factory hitch for plane tow. Fully certificated $795. Also Waco UPF-7, equipped with glider hitch and 3 place conversion kit. C. M. Hayes, Hulman Field, Terre Haute, Ind.

STEARMAN, Lycoming 220, 450 hours since major. Just licensed. Bargain. T-50 Cessna 550 hrs on engine licensed in June. Metal Props. Box 242, Ph 26, Coffeyville, Kansas.

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DIRECTIONAL gyro for auto pilot $60.00. Rate of climb, $12.00. Gyro horizon $25.00. Grimes 24V lights $12.00. Arthur Curtis, 6909 Oakridge, Hyattsville, Md.

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ARMY Air Force Type A-2 Computer now available, $2.00; Mark II (Weems) Navigation Plotter, $2.00; Dalton Navigational Computer with book of instructions, $5.00; New Type "C" American Airlines in fine leather case with instructions, $5.00; E-6B Army Type Navigational Computer with leather case and Instructions, $10.00; Link (Bubble Type) Sextant in carrying case, $230; Aviation Sun Glasses, $12.00. Dealers; new catalog now ready—Write for agency. Pan American Navigation Service, 12021 Ventura Blvd., N. Hollywood, Calif.

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				PLANE	ENGINE	PLANE	ENGINE	
AERONCA								
Lewis F. Lavery, Lavery's Seaplane Service, Round Lake, New York	CA65	Cont. 65	1940	3008	3176	50	150	$3,000.03
Thompson Flying Service, P. O. Box 308, Healdsburg, California	7AC	Cont. 65	1946	600	600	600	0	2,295.00
Southern Minnesota Aviation Service, Inc., Owatonna, Minnesota	Super Chief	Lyc. 65	1941	1629	1629	0	0	2,250.00
Blair County Aviation Co., Altoona Blair County Airport, Martinsburg, Pennsylvania	Champion	Cont. 65	1946	100	100	100	100	2,250.00
Henderson Airpark, Henderson, Kentucky	7AC	Cont. 65	1946	210	210	210	210	2,250.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	Champion	Cont. 65	1946	50	50	50	50	2,250.00
Ben T. Keeton, Municipal Airport, Grenada, Mississippi	Champion	Cont. 65	1946	106	106	106	106	2,200.00
Northwest Flying Service, Boise Airpark, Boise, Idaho	7AC	Cont. 65	1946	648	291	0	391	2,195.00
Northwest Flying Service, Boise Airpark, Boise, Idaho	7AC	Cont. 65	1946	613	613	0	0	2,195.00
Resort Flying Service Inc., Narrowsburg, New York	7AC	Cont. 65	1946	113	113	113	113	2,175.00
Canfield Airways, Waterloo, Iowa	7AC	Cont. 65	1946	180	180	0	0	2,150.00
Ben T. Keeton, Municipal Airport, Grenada, Mississippi	Champion	Cont. 65	1946	190	190	190	190	2,100.00
Nichols Aviation Co., 840 Bush Street, Jackson, Michigan	C65	Cont. 65	1941	450	25	40	25	2,100.00
Canfield Airways, Waterloo, Iowa	7AC	Cont. 65	1946	204	204	0	0	2,100.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	Champion	Cont. 65	1946	165	165	0	0	2,100.00
Lester Dethloff, Bedford Airport, Bedford, Ohio	7AC	Cont. 65	1946	290	290	290	290	2,095.00
Ben T. Keeton, Municipal Airport, Grenada, Mississippi	Champion	Cont. 65	1946	271	271	271	271	2,000.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	Champion	Cont. 65	1946	175	175	0	0	2,000.00
Duane D. Otis, Huntingburg Airport, Huntingburg, Indiana	7AC	Cont. 65	1946	175	175	175	175	2,000.00
Resort Flying Service Inc., Narrowsburg, New York	7AC	Cont. 65	1946	221	221	221	221	1,975.00
Luther Flying Service, Salix Airport, Salix, Pennsylvania	7AC	Cont. 65	1946	447	447	447	447	1,500.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	TAL	Cont. 65	1941	1500	1500	10	10	1,500.00
Southern Airmotive Airport, Dothan, Alabama	C50L	Lyc. 50	1939	1543	1551	725	125	1,650.00
Brockton Airways Inc., Brockton Airport, Brockton, Massachusetts	Trainer	Cont. 65	1943	603	603	15	15	1,600.00
Brockton Airways Inc., Brockton Airport, Brockton, Massachusetts	Defender	Lyc. 65	1941	2100	1300	32	32	1,600.00
Mott Airways, Mott, North Dakota	Chief	Cont. 50	1939	1000	120	120	120	1,400.00
Luther Flying Service, Salix Airport, Salix, Pennsylvania	TAC	Cont. 65	1941	1464	1132	409	409	1,300.00
BEECH								
Spartan Aero Repair, Municipal Airport, Tulsa, Oklahoma	AT-11	P & W 450	1942	2193	2756	0	0	3,500.00
Spartan Aero Repair, Municipal Airport, Tulsa, Oklahoma	AT-11	P & W 450	1942	1797	730	0	0	3,500.00
Clinton Aviation Co., Stapleton Air Field, Denver, Colorado	C17L	Jacobs	1936	257	257	257	257	1,850.00
CESSNA								
Bush Aviation Enterprises, New Albany-Jeff Airport, Jeffersonville, Indiana	UC-78	Jacobs 225	1943	1100	100	50	150	10,750.00
Mrs. Philip H. Kroh, Box 516, Danville, Illinois	T-50	Jacobs 225	1941	2202	1401	46	78	9,300.00
Kentucky Air Transport, Inc., Bowman Field, Louisville 5, Kentucky	Airmaster	Warner 165	1939	1071	1073	198	196	9,000.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	T-50	Cont. 225	1942	1100	200	50	200	8,000.00
Don E. Pratt, Hays, Kansas	C	Warner 165	1939	1253	1055	275	75	7,500.00
DeLong Aviation Service, 310 South Main Street, Gainesville, Georgia	T-50	Jacobs 245	1943	1300	345	0	0	6,500.00
Herman L. Martin, P. O. Box 598, Walla Walla, Washington	C-34	Warner 145	1936	2632	350	350	350	5,500.00
Park Region Airways, Box 113, Park Rapids, Minnesota	140	Cont. 85	1946	120	120	0	0	3,765.00
Farlys Air Park, Box 72, New Baltimore, New York	UC-78	Jacobs 225	1944	600	500	220	220	3,500.00
CULVER								
Morrison Flying Service, Municipal Airport, Helena, Montana	LCA	Cont. 75	1941	350	350	50	50	2,350.00
ERCOUPE								
Parks Aircraft Sales & Service, Palwaukee Airport, Wheeling, Illinois	415	Cont. 75	1946	70	70	0	0	3,600.00
Southern Arizona Airlines, Post Office, Box 118t, Tucson, Arizona	416	Cont. 75	1946	256	256	256	256	3,400.00
Parks Aircraft Sales & Service, Palwaukee Airport, Wheeling, Illinois	415	Cont. 75	1946	75	75	0	0	3,350.00
Parks Aircraft Sales & Service, Palwaukee Airport, Wheeling, Illinois	415	Cont. 75	1946	30	30	0	0	3,300.00
Southern Minnesota Aviation Service, Inc., Owatonna, Minnesota	415	Cont. 75	1946	185	185	0	0	3,300.00
Lycoming Airways, Williamsport Airport, Montoursville, Pennsylvania	415	Cont. 75	1946	54	54	54	54	3,100.00
Cannon Aviation Co., Inc., Municipal Airport, Hickory, North Carolina	415	Cont. 75	1946	200	200	200	200	3,000.00
Syracuse Flying School, Syracuse Airport, Syracuse, New York	415	Cont. 75	1946	275	275	275	0	2,950.00
Hughes Flying Service, Capital City Airport, Lansing, Michigan	415	Cont. 65	1940	1161	1161	1161	297	2,550.00
FAIRCHILD								
Pine Valley Airport, 459 First National Bank Bldg., Colorado Springs, Colorado	24-K	Ranger 180	1938	812	1801	812	42	10,000.00
Herman L. Martin, P. O. Box 598, Walla Walla, Washington	24	Warner 145	1940	1880	1845	1880	300	6,500.00
Ben T. Keeton, Municipal Airport, Grenada, Mississippi	24-J	Warner 145	1936	1200	1200	35	35	6,000.00
Nichols Aviation Company, 840 Bush Street, Jackson, Michigan	24G	Warner 145	1937	1100	1100	20	110	5,000.00
M. Foose, 6141 West 95th Street, Oak Lawn, Illinois	PT-23	Cont. 220	1943	400	450	20	45	2,995.00
M. Foose, 6141 West 95th Street, Oak Lawn, Illinois	PT-23	Cont. 220	1943	310	310	0	310	2,750.00
Bush Aviation Enterprises, c/o Airport, Jeffersonville, Indiana	PT-23	Cont. 220	1943	300	300	300	300	2,100.00
Brockton Airways Inc., Brockton Airport, Brockton, Massachusetts	PT-19B	Ranger 175	1944	306	306	306	306	2,050.00
Chardon Airways Inc., Chardon, Ohio	PT-19	Ranger 175	1943	480	480	480	50	2,000.00
Clinton Aviation Co., Stapleton Airfield, Denver, Colorado	PT-19	Ranger 175	1943	562	562	562	562	1,850.00
Clinton Aviation Co., Stapelton Airfield, Denver, Colorado	PT-19	Ranger 175	1943	531	531	531	531	1,850.00
Terry Flying Service, Chapman Field, Waterloo, Iowa	M-62A	Ranger 125	1942	2028	612	308	612	1,450.00
Arkansas Aviation Service, Grider Field, Pine Bluff, Arkansas	PT-19A	Ranger 175	1941	1050	1400	1050	345	1,295.00
Midwest Flyers, Lakeside Airport, East St. Louis, Illinois	PT-19	Ranger 175	1942	2000	1600	125	400	1,275.00
Spartan Aero Repair, Municipal Airport, Tulsa, Oklahoma	PT-19	Ranger 175	1944	448	448	448	448	1,275.00
Hughes Flying Service, Capital City Airport, Lansing, Michigan	PT-19	Ranger 175	1942	1336	640	1336	640	1,250.00
Mohawk Valley Aviation, Inc., Box 66, Williamstown, Massachusetts	PT-19	Ranger 175	1942	1900	1900	1900	385	1,000.00
Milestone Sales & Service, Platte Airport, Platteville, Wisconsin	M-62A	Ranger 175	1941	2700	1075	20	474	1,000.00
Midwest Flyers, Lakeside Airport, East St. Louis, Illinois	PT-19	Ranger 175	1942	2100	1600	100	525	975.00
FLEET								
Blue Earth Flying Service, Inc., Blue Earth, Minnesota	16B	Kinner 125	1941	1500	850	140	140	1,550.00
GLOBE								
Syracuse Flying School, Syracuse Airport, Syracuse, New York	13	Cont 85	1946	101	101	101	101	3,400.00
LUSCOMBE								
Canfield Airways, Waterloo, Iowa	8A	Cont. 65	1946	7	7	0	0	3,250.00
Canfield Airways, Waterloo, Iowa	8A	Cont. 65	1946	162	162	0	0	2,600.00
Herman L. Martin, P. O. Box 598, Walla Walla, Washington	8A	Frank. 90	1941	3490	550	450	35	2,400.00
MONOCOUPE								
A. D. Zaebst, P. O. Box 601, Ocala, Florida		Frank. 90	1943	750	750	0	0	3,000.00
Don E. Pratt, Municipal Airport, Hays, Kansas	90A	Lambert 90	1938	840	840	80	80	2,200.00
NAVY								
Luther Flying Service, Salix Airport, Salix, Pennsylvania	N3N-3	R-760-8	1941	2609	2397	174	174	975.00
NORTH AMERICAN								
Farlys Air Park, Box 72, New Baltimore, New York	AT-6	P & W 600	1943	700	700	170	170	3,000.00

DEALER	MODEL NO.	TYPE ENGINE	YEAR BUILT	TOTAL HOURS		HOURS SINCE LAST MAJOR OVERHAUL		PRICE
				PLANE	ENGINE	PLANE	ENGINE	
PIPER								
Lambros Air College, 45 Bergen Turnpike, Ridgefield Park, New Jersey	J3	Cont. 65	1946	300	300	0	0	$3,200.00
Lambros Air College, 45 Bergen Turnpike, Ridgefield Park, New Jersey	J3	Cont. 65	1941	2000	2000	400	400	2,800.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	Coupe	Cont. 65	1939	445	445	0	20	2,250.00
James Frazier, 238 Lee Street, Evanston, Illinois	J4-E	Cont. 75	1941	75	350	75	75	2,200.00
Plain Field Airways Inc., Plainfield, Connecticut	J5	Cont. 75	1941	399	419	13	13	2,100.00
Bush Aviation Enterprises, c/o Airport, Jeffersonville, Indiana	J5	Cont. 75	1941	1000	1000	0	0	2,000.00
Twin Cities Flying Service, Twin Cities Airport, Benton Harbor, Michigan	A5A	Cont. 75	1940	1450	200	1450	200	2,000.00
Westwind Air Service Company, Detroit City Airport, Detroit 5, Michigan	J5	Cont. 65	1940	1502	1208	2	2	1,850.00
Bush Aviation Enterprises, c/o Airport, Jeffersonville, Indiana	J4	Cont. 65	1940	400	400	100	100	1,850.00
Hawke Dusters & Flying Service, P. O. Box 1056, Modesto, California	J4-A	Cont. 65	1940	453	453	86	86	1,800.00
Herman L. Martin, P. O. Box 598, Walla Walla, Washington	J3	Cont. 65	1939	3900	1570	500	26	1,800.00
Akron Airways, Inc., Municipal Airport, Akron, Ohio	J3	Lyc. 65	1943	1215	269	1215	269	1,650.00
Lester Dethloff, Bedford Airport, Bedford, Ohio	J3	Cont. 65	1943	800	700	150	75	1,600.00
Arkansas Aviation Service, Grider Field, Pine Bluff, Arkansas	J4-F	Cont. 65	1939	1200	1200	1200	50	1,595.00
Flyaway Aviation Service, Greenville Airport, Greenville, Alabama	J3	Frank. 60	1939	1200	400	0	0	1,495.00
Johnie Cleveland, 3221 Downing Street, Jackson, Mississippi	J3	Trainer 75	1941	1100	1100	40	40	1,400.00
Wheeler Flying Service, Municipal Airport, P. O. Box 1054, Tallahassee, Florida	L4	Cont. 65	1942	704	704	437	100	1,350.00
Westwind Air Service Company, Detroit City Airport, Detroit 5, Michigan	J3	Cont. 65	1940	2259	2654	0	0	1,250.00
Bud Fleck, Fleck's Airpark, Springfield, Illinois	J3	Frank. 65	1941	3600	3600	3600	500	1,250.00
Chardon Airways Inc., Chardon, Ohio	J3	Frank. 50	1939	1900	1900	200	200	1,050.00
Resort Flying Service Inc., Narrowsburg, New York	J3	Cont. 40		220	220	10	10	950.00
Park Region Airways, Box 113, Park Rapids, Minnesota	J2	Cont. 40	1945	700	700	100	100	800.00
PORTERFIELD								
Midwest Flyers, Lakeside Airport, East St. Louis, Illinois	LP65	Lyc. 65	1941	1800	1500	150	125	1,575.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	LP65	65 HP	1941	1595	1398	122	303	1,500.00
Rawdon Bros. Flying Service, Wichita, Kansas	LP65	Lyc. 65		1630	1661	1630	435	1,200.00
REARWIN								
Clinton Aviation Co., Stapleton Airfield, Denver, Colorado	9000	Warner 90	1937	963	963	963	0	1,850.00
RYAN								
Akron Airways, Inc., Municipal Airport, Akron, Ohio	PT-22	Kinner 165	1943	2201	640	2201	640	1,850.00
Ben T. Keeton, Municipal Airport, Grenada, Mississippi	ST3-KR	Kinner 160	1942	1980	396	14	396	1,750.00
Johnson Flying Service P. O. Box 201, Greenwood, South Carolina	ST3-KR	Kinner 160		1962	419	57	0	1,495.00
STEARMAN								
Akron Airways, Inc., Municipal Airport, Akron, Ohio	PT-17	Cont. 220	1942	2881	1436	2881	248	1,750.00
Milestone Sales & Service, Platte Airport, Platteville, Wisconsin	A-75NI	Cont. 220	1943	2011	1895	11	64	1,500.00
Midwest Flyers, Lakeside Airport, East St. Louis, Illinois	PT-17	Cont. 220	1942	2000	1500	50	612	1,250.00
Akron Airways, Inc., Municipal Airport, Akron, Ohio	PT-17	Cont. 220	1943	2538	2538	2538	2538	1,200.00
STINSON								
Mid-West Air Transport, Inc., Municipal Airport, Evansville, Indiana	SR9	Wright 350	1938	2000	2000	175	175	7,900.00
Arlo W. Mather, 4538 Ridge Road, Cleveland, Ohio	SR5	Lyc. 245	1936	3000	3000	0	0	5,200.00
Hawthorne Flying Service, Hawthorne Field, Orangeburg, South Carolina	SR6-B	Lyc. 260	1935	1402	1402	1402	0	4,000.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	10A	Frank. 90	1941	590	617	590	106	3,000.00
Southern Skyways, Municipal Airport, Houston 12, Texas	L5	Lyc. 185	1942	970	402	10	402	2,750.00
Hawthorne Flying Service, Hawthorne Field, Orangeburg, South Carolina	105	Cont. 80	1939	1200	800	200	200	2,100.00
Don E. Pratt, Municipal Airport, Hays, Kansas	10	Cont. 80	1940	995	1065	995	202	1,800.00
TAYLORCRAFT								
Luther Flying Service, Salix Airport, Salix, Pennsylvania	BC12-D	Cont. 65	1946	125	125	125	125	2,650.00
Bush Aviation Enterprises, c/o Airport, Jeffersonville, Indiana	BC12	Cont. 65	1946	40	40	40	40	2,595.00
Olathe Flying Service, Inc., Heli's Airport, Olathe, Kansas	2PCLM	Cont. 65	1946	57	57	57	57	2,500.00
Farly's Air Park, Box 72, New Baltimore, New York	BC12-D	Cont. 65	1946	6	6	6	5	2,300.00
Duane D. Otis, Huntingburg Airport, Huntingburg, Indiana	BC12-D	Cont. 65	1946	125	125	125	125	2,280.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	BL	10.145.132	1941	1254	1076	94	516	2,250.00
Ellis M. Huston, Windsor, Missouri	BC12-D	Cont. 65	1946	33	33	0	0	2,195.00
Southern Minnesota Aviation Service, Inc., Owatonna, Minnesota	BL65	Lyc. 65	1941	1899	1899	128	128	2,150.00
Brunswick Flying Service, Brunswick, Maine	BL	Lyc. 65	1941	790	790	290	290	2,100.00
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	BF65	Frank. 65	1941	2500	2500	300	300	2,000.00
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	BL65	Lyc. 65	1941	2500	2500	100	100	2,000.00
Cannon Aviation Co., Inc., Municipal Airport, Hickory, North Carolina	BC12	Cont. 65	1941	900	900	900	100	2,000.00
Florida Air Activities, Municipal Airport, Orlando, Florida	BL65	Lyc. 65	1940	1150	240	5	240	2,000.00
Nichols Aviation Co., 840 Bush Street, Jackson, Michigan	BF	Frank. 65	1941	1427	1427	0	486	1,850.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	BL65	65 HP	1941	1362	1911	1362	963	1,850.00
Duane D. Otis, Huntingburg Airport, Huntingburg Indiana	DC065	Cont. 65	1943	590	590	0	0	1,800.00
Hawke Dusters & Flying Service, P. O. Box 1056, Modesto, California	L2-A	Cont. 65	1942	736	736	391	391	1,750.00
Mid-West Air Transport, Inc., Municipal Airport, Evansville, Indiana	BL65	Lyc. 65	1940	2600	1050	1000	250	1,750.00
Francis School of Aviation, Capitol City Airport, Lansing, Michigan	BL65	65 HP	1940	1680	1222	69	586	1,750.00
Duane D. Otis, Huntingburg Airport, Huntingburg, Indiana	DC065	Cont. 65	1943	725	625	0	400	1,700.00
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	BL65	Lyc. 65	1940	2500	2500	100	100	1,600.00
Cody-Wiecking Aero Service, Box 165, Scappoose, Oregon	DCO	Cont. 65	1942	1000	1000	500	500	1,600.00
Terry Flying Service, Chapman Field, Waterloo, Iowa	DCO	Cont. 65	1943	625	623	0	0	1,595.00
Terry Flying Service, Chapman Field, Waterloo, Iowa	DCO	Cont. 65	1943	920	528	146	146	1,500.00
Terry Flying Service, Chapman Field, Waterloo, Iowa	DCO	Cont. 65	1942	500	500	0	0	1,495.00
J. S. Kidwell, Windsor, Missouri	L2-M	Cont. 65	1944	190	190	0	0	1,495.00
Goddard Flying Service, Ardmore Airport, Ardmore, Oklahoma	Tandem	Cont. 65	1942	450	450	450	10	1,300.00
Hughes Flying Service, Capitol City Airport, Lansing, Michigan	L2	Cont. 65	1942	1297	912	108	108	1,250.00
Sharon-Foxboro Airways, Inc., P. O. Box 197, Sherman Airport, Massfield, Massachusetts	696	Cont. 65	1939	1900	1900	500	50	1,200.00
VULTEE								
A & B Aviation Service, P. O. Box 665, San Rafael, California	BT-13A	P & W 450	1942	1480	383	1480	383	2,250.00
A & B Aviation Service, P. O. Box 665, San Rafael, California	BT-13A	P & W 450	1942	1120	275	1120	275	2,250.00
Spartan Aero Repair, Municipal Airport, Tulsa, Oklahoma	BT-13A	P & W 450	1942	200	1478	200	136	2,250.00
Akron Airways, Inc., Municipal Airport, Akron, Ohio	BT-13	P & W 450	1945	2706	102	2706	102	2,075.00
Akron Airways, Inc., Municipal Airport, Akron, Ohio	BT-13	P & W 450	1944	2706	105	2706	105	2,075.00
Akron Airways, Inc., Municipal Airport, Akron, Ohio	BT-13	P & W 450	1943	2706	105	2706	105	2,075.00
Spartan Aero Repair, Municipal Airport, Tulsa, Oklahoma	BT-13	P & W 450	1942	200	1478	200	135	1,975.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	SNV-1	P & W 450	1943	1500	1500	0	250	1,850.00
Echelon Aeronautical Service, Box 104, Haddonfield, New Jersey	BT-13A	P & W 450	1943	475	475	475	475	1,850.00
Hawthorne Flying Service, Hawthorne Field, Orangeburg, South Carolina	BT-13	P & W 450		448	180	448	180	1,800.00
St. Louis Flying Service, Kratz Field, St. Louis, Missouri	BT-13A	P & W 450	1942	3458	439	3358	439	1,775.00
St. Louis Flying Service, Kratz Field, St. Louis, Missouri	BT-13B	P & W 450	1943	396	396	496	396	1,775.00
H. M. Kimball, 10835 Duprey, Detroit, Michigan	BT-13	P & W 450	1942	2924	1023	2924	530	1,750.00
John Bartell, 158 South Pearl Street, Albany, New York	13B	P & W 450	1944	500	500	10	10	1,700.00
Lincoln F. Stock, Clinton Heights, Rensselaer, New York	BT-13B	P & W 450	1942	975	975	975	132	1,695.00
Fred Bartholomew Aviation Sales, 2207 Croydon Court, Oklahoma City 6, Oklahoma	SNV-2	P & W 450	1944	730	745	730	147	1,650.00
Alabama Aviation Service, Russell Field, Alexander City, Alabama	BT-13	P & W 450	1941	3090	1603	0	371	1,600.00
Arkansas Aviation Service, Grider Field, Pine Bluff, Arkansas	SNV	P & W 450	1943	1100	900	1100	100	1,595.00
Champion-Wright Flying Service, Municipal Airport, Oxford, Mississippi	BT-13A	P & W 985	1941	3000	341	10	341	1,495.00
Champion-Wright Flying Service, Municipal Airport, Oxford, Mississippi	BT-13A	P & W 450	1941	3000	341	10	341	1,495.00
Champion-Wright Flying Service, Municipal Airport, Oxford, Mississippi	BT-13A	P & W 450	1941	3800	341	0	341	1,450.00
Blair County Aviation Co., Martensburg, Pennsylvania	BT-13	P & W 450	1943	2187	550	2187	150	1,400.00
Brockton Airways, Inc., Brockton Airport, Brockton, Massachusetts	BT-13	P & W 450	1944	715	735	715	105	1,300.00
King's Air Service, Milledgeville, Georgia	BT-13	P & W 450	1942	1006	1010	100	280	1,200.00
Champion-Wright Flying Service, Municipal Airport, Oxford, Mississippi	BT-13A	P & W 985	1941	3800	447	3800	447	1,195.00
Arkansas Aviation Service, Grider Field, Pine Bluff, Arkansas	SNV	P & W 450	1943	1300	900	1300	80	1,195.00
Midwest Flyers, Lakeside Airport, East St. Louis, Illinois	BT-13	P & W 450	1943	2200	1600	25	250	1,125.00

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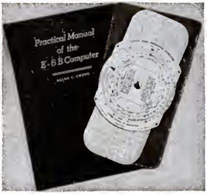

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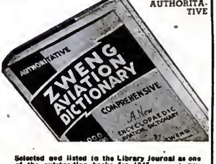
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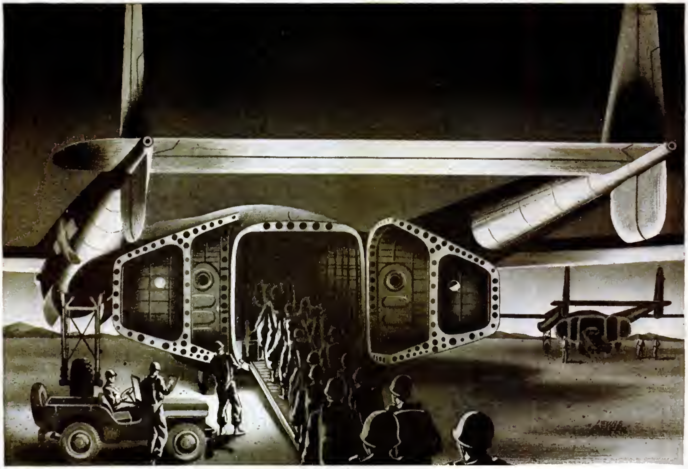

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